THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIX. No. 2176.] LONDON, JANUARY 24, 1905. [57TH YEAR. PRICE 6d.

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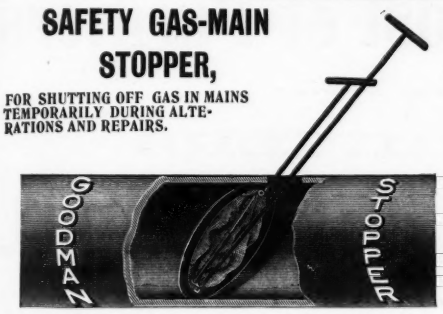

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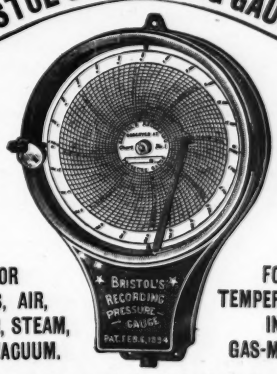

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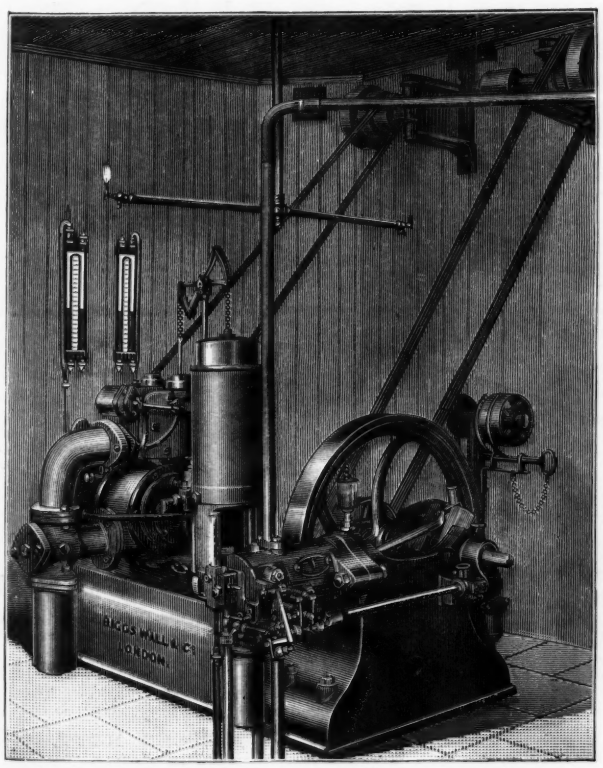

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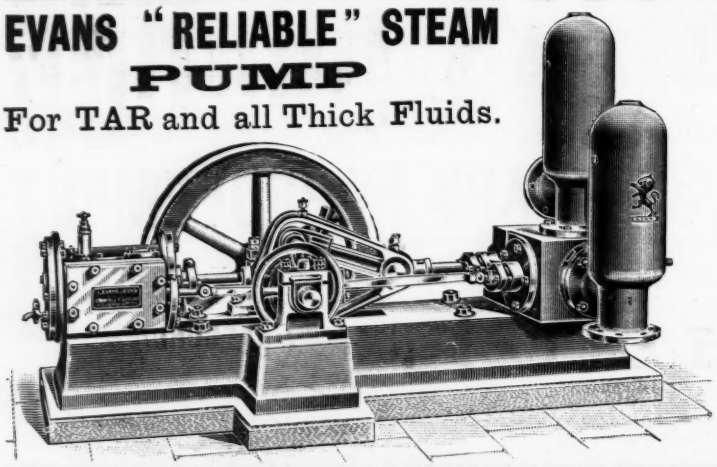

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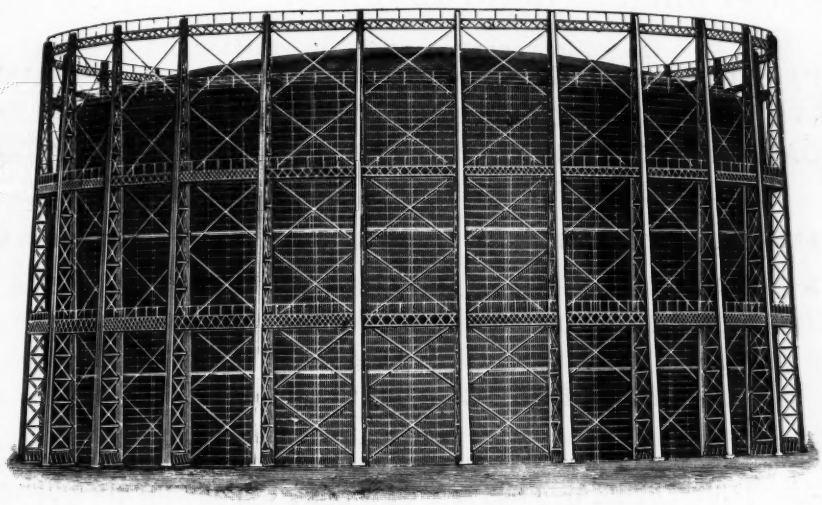

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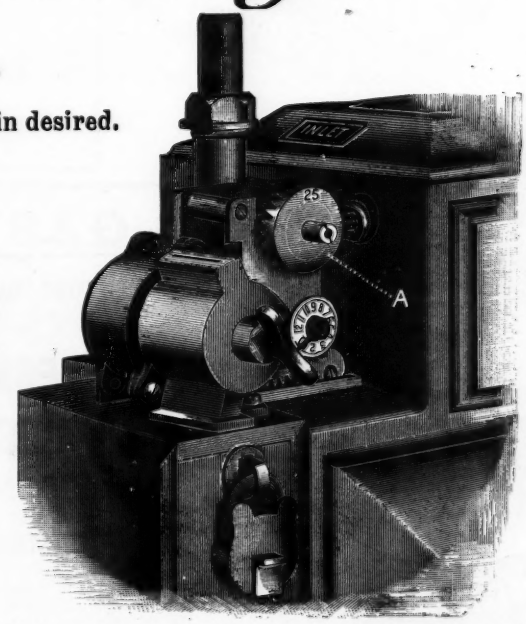

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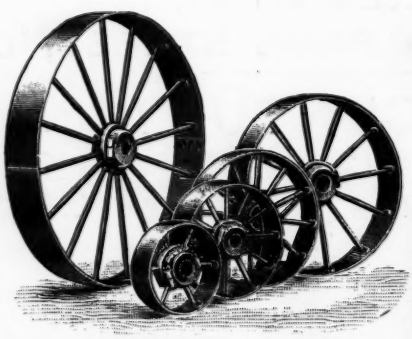

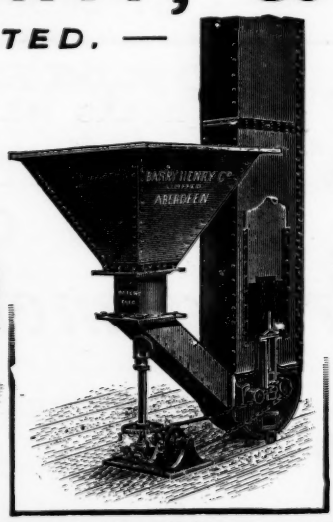

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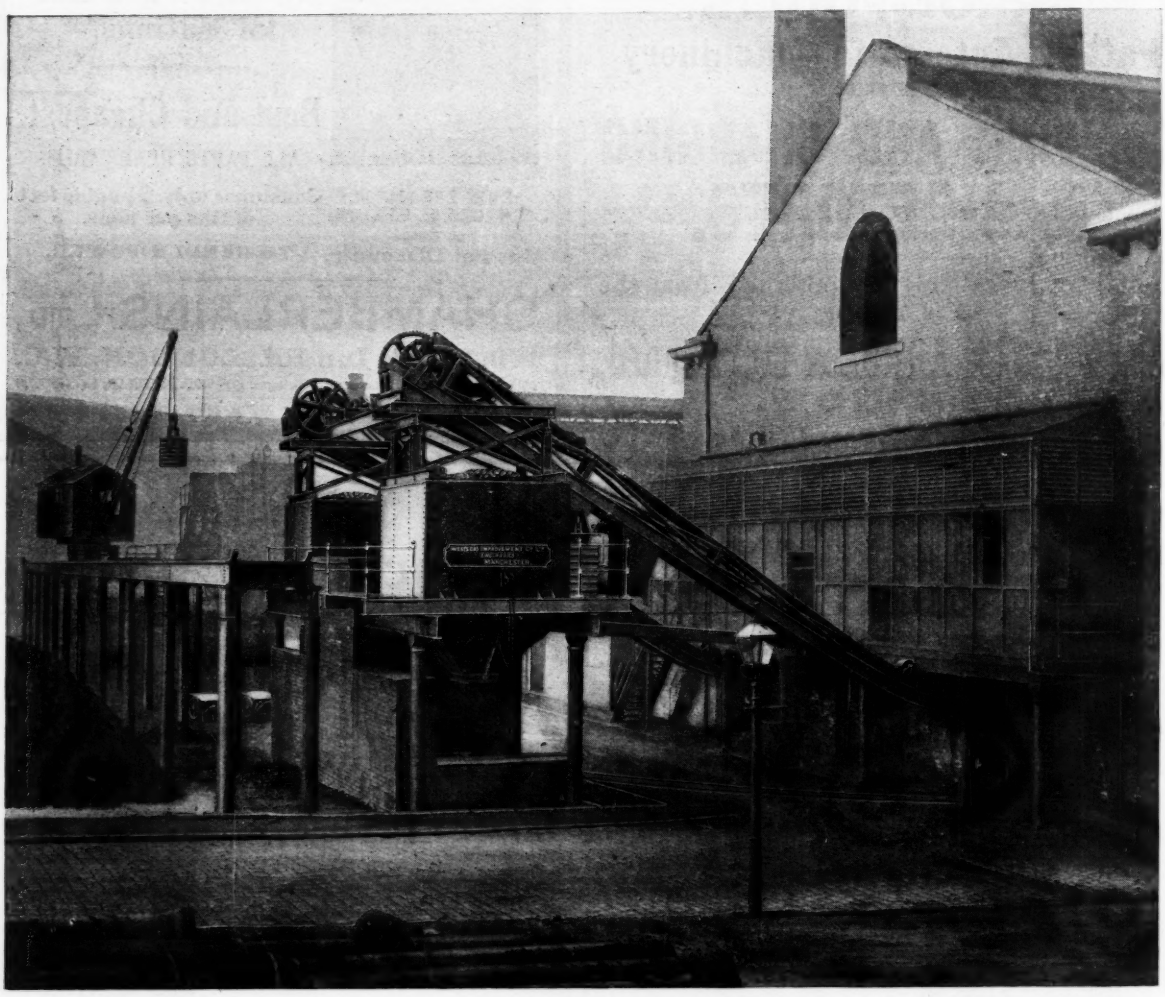

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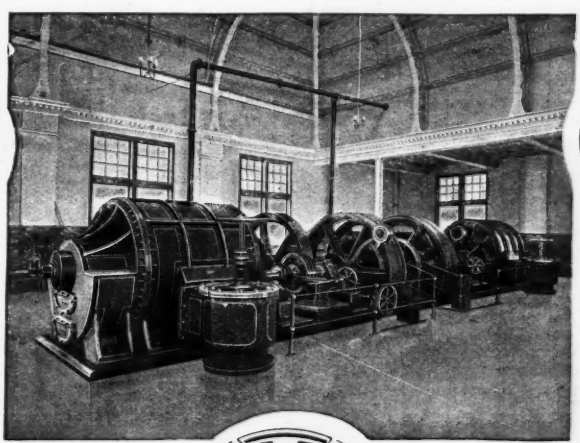

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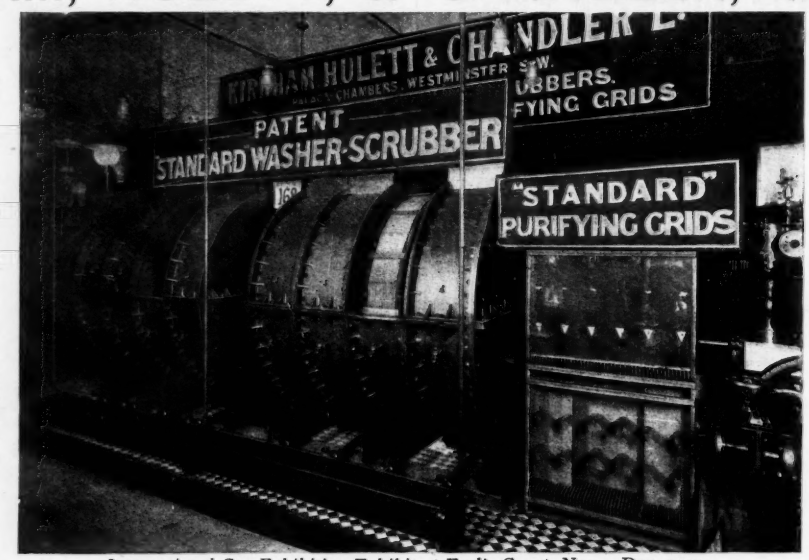

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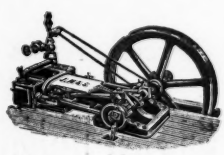

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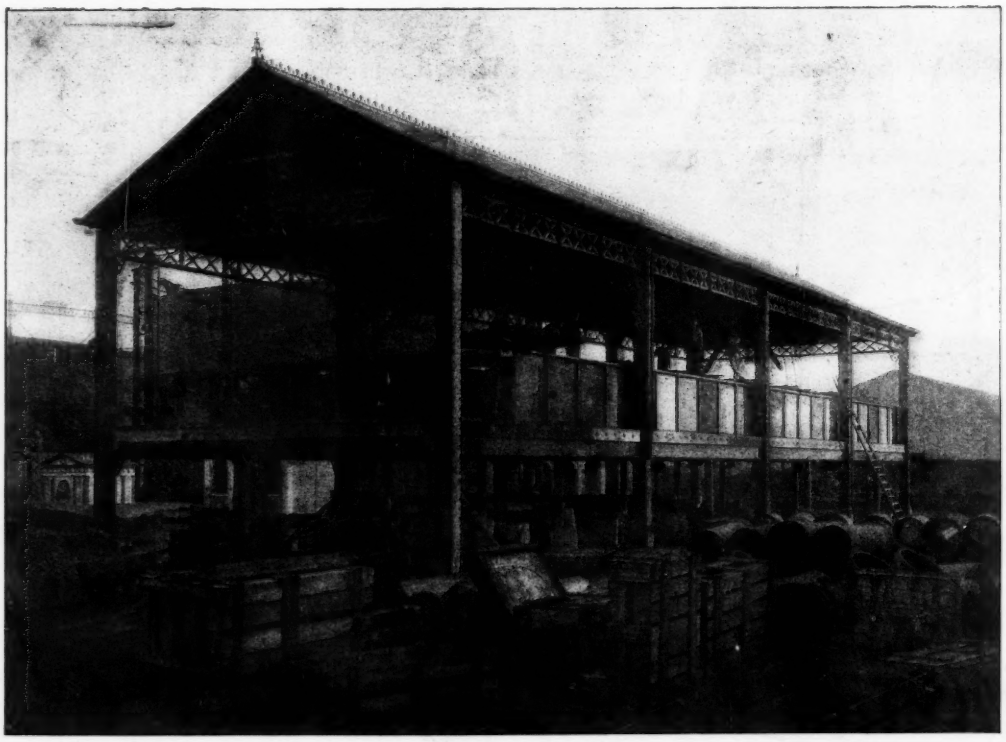

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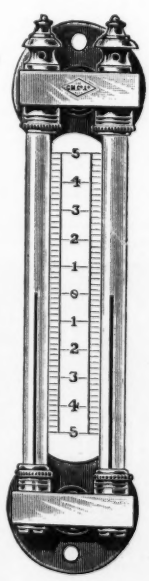

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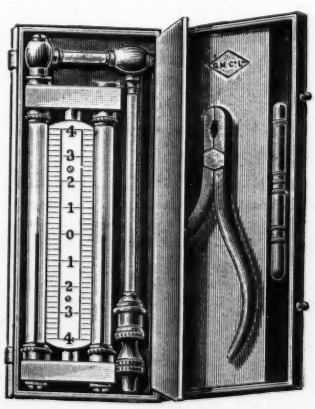

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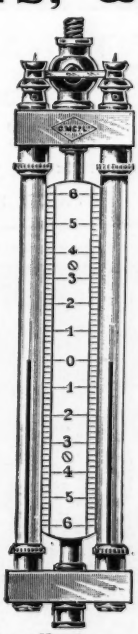

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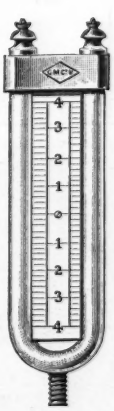

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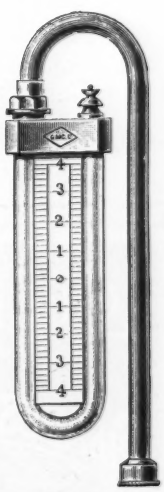

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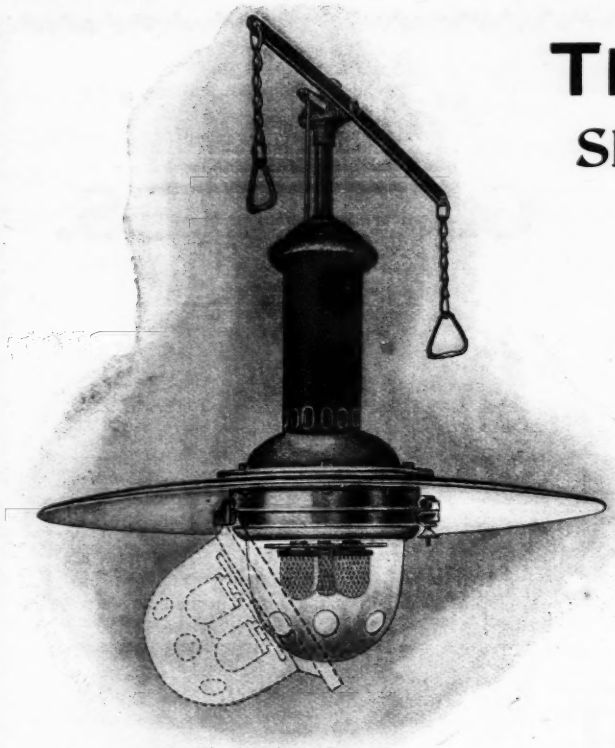

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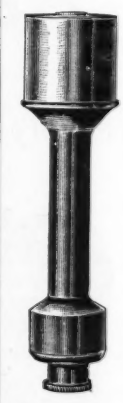

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—
Accidents in Gas-Works 213
Labour Troubles on the Continent . . . 213
The Industries and Technical Instruction . 214
Law-Assisted Co-Partnership 214
The "Question-Box" Confiscated—Compensation to Directors—Brickmaking in Gas-Works—The Rating of London Boroughs 215
WATER AFFAIRS—
Water Legislation for Next Session. . . 217

ESSAYS AND REVIEWS.

Services of the Lady Lecturer and Teacher . 218
Gas Stock and Share Market 219
Electric Lighting Memoranda 219
The International Exhibition at Liége . . 220
Thermal Efficiency of Modern Motive-Power Engines 221
Liability of Shareholders in English Companies Trading Abroad 221
Neilson on Wind Pressure 222
Water Bills for 1905 223

TECHNICAL RECORD.

A Long High-Pressure Gas-Main 226
Arrangement for Blowing off Air from Gasholder Crowns 227
Manchester District Junior Gas Association . 228
Gas-Engines at the St. Louis Exhibition . . 229
Value of the Flame of Combustibles . . . 230
Combustion of Ethylene 230
The Manufacture of Cyanides 231
Helmet Respirators for Saving Life . . . 231
London's Store of Underground Water . . 231
Scraping Water-Mains at Melbourne . . . 232
A Concrete-Steel Water-Tower. 233
The Construction of Reservoirs. 233

COMMUNICATED ARTICLES.

Proposed Legislation on Gas Testing with Special Regard to Illuminating Power. By H. Leicester Greville, F.I.C., F.C.S. . . 224
Derby Hydraulic Main Arrangement. By J. Ferguson Bell 225

REGISTER OF PATENTS.

Automatically Controlling Gas-Jets—Meunier, S., and Anderson, J. 235
Making Coke, &c.—Settle, T., and Padfield, W. A. 235
Extracting Tar and Other Impurities from Illuminating Gas—Everitt, W., and Redman, T. 235
Gas-Purifiers—Boult, A. J. (La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz) 236
Patent Notices 237

CORRESPONDENCE.

A Peculiar Feature of the Recent Fog. . . 238
The Lewes Water-Gas Plant in Germany . 238
Hydraulic Mains 238
The Catalytic Action of Welsbach Mantles . 238

LEGAL INTELLIGENCE.

Charges Against a Gas Company's Secretary. 238

MISCELLANEOUS NEWS.

The Fatality at the Batley Gas-Works . . 239
Otley Gas Purchase Bill—Meeting of Ratepayers. 239
Road Openings in Lambeth 239
Sales of Stocks and Shares 239
Brickmaking at the Plymouth Gas-Works . 240

MISCELLANEOUS NEWS (*continued*)—
Compensation to London Water Directors . 240
Metropolitan Water Board 242
Broken Water Pipes and Damaged Roads . 242
The Torpoint Water Bill. 243
Unfortunate Water Scheme at Abertillery—A Dangerous Reservoir 243
Notes from Scotland 244
Current Sales of Gas Products 245
Coal Trade Reports 246
Trade Notes 246
Stock and Share List 249

PARAGRAPHS.

Gas Consumers' Literature 216
Report of the Gaslight and Coke Company—Société Technique du Gaz en France . . 217
The Late Mr. J. F. Bromley 220
Reports of Gas Associations, 1904 224
High-Power Gas-Engines in San Francisco . 226
Obituary and Personal 227
Casualties in Tar-Distillation Works . . . 227
Retiring Members of Parliament—The Public Lighting of New York—Motive Power for Electricity Works in Germany 232
Birmingham and Compensation Water to the Wye 237
Gas Consumption and Cookers at Southport—Fatal Acetylene Explosion—Proposed Purchase of the Scalby Water-Works—Inauguration of a New Holder at Newbury—Suffocation by Gas at St. Leonards—The Depth of Gas-Mains in Wandsworth—Lichfield and the Electric Light 247
Reduction in Price at Hexham—Collection of Water Rates in the Metropolis—Incandescent Gas-Burners for Hospital and Office Lighting 248

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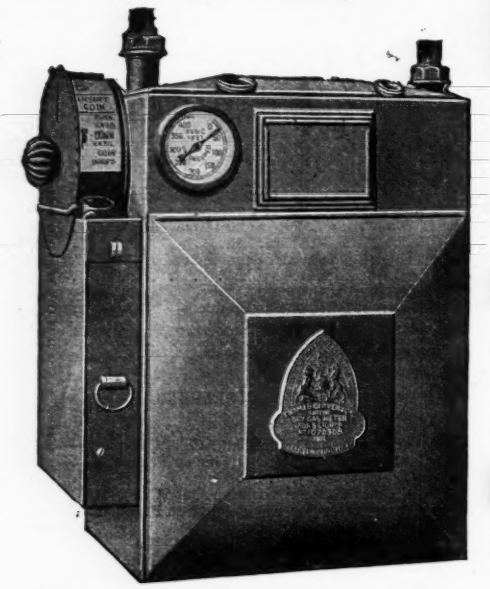

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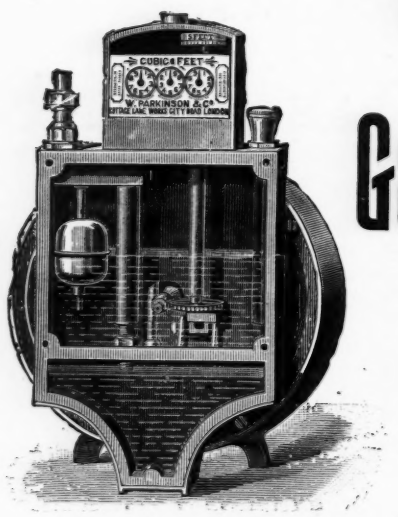

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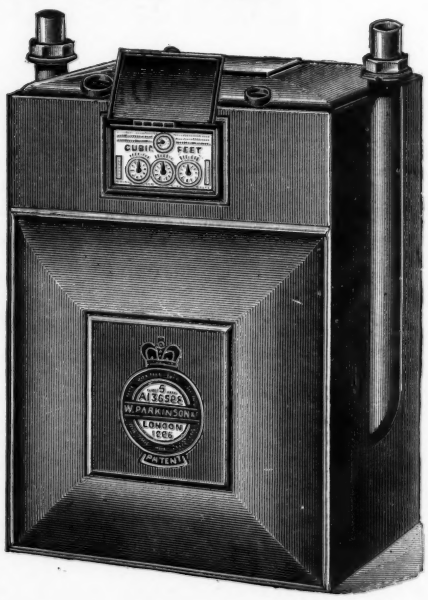

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EDITORIAL NOTES—GAS, &c.

Accidents in Gas-Works.

ALTHOUGH the winter has not yet run its course, it has already become unenviably notable, in connection with gas supply, by a series of accidents in gas-works which is believed to be wholly without precedent in so short a space of time. Commencing with the disastrous explosion at Saltley, by which three men lost their lives and much valuable property was destroyed, there followed another explosion at the Hendon Gas-Works, which wrecked the station meter and governor house, damaged the meter, and caused the gas supply to be cut off the district for some hours. Fortunately no one was injured on this occasion; but at the Bloxham Gas-Works soon afterwards an explosion occurred by which, unfortunately, the Manager, Mr. T. C. Betteridge, was killed. During the succeeding week, a fire, succeeded by an explosion, occurred at the Padiham Gas-Works, which, although happily unattended by any casualties, was of an alarming and destructive character. In addition to all these, there have been more than the usual number of cases of gas poisoning; perhaps the most tragic of these being that which occurred shortly after Christmas Day, in George Street, Hampstead Road, the victims of which were a mother and one of her sons, two other children having a narrow escape for their lives. The cause of this was the fracture of a street-main, from which the gas escaped into the adjoining houses.

The latest addition to this roll of disaster was recorded in our issue of last week. A fatality occurred on the 13th inst. at the Batley Corporation Gas-Works, by which the highly-respected Manager of the works, Mr. J. F. Bromley, and an employee named George Sandall, lost their lives. They were found lying in a coal-shed adjoining the building in which the sulphate of ammonia plant is situated, and in close proximity to the valves of the purifiers forming part of this plant. It is conjectured that Mr. Bromley had instructed Sandall to change the purifiers, and that he accompanied him for this purpose. In the course of performing the operation, the spent gases from the sulphate plant were in some way or other allowed to escape, and both were overpowered by them. A report of the proceedings at the adjourned inquest will be found in another column; and from this it appears probable that Mr. Bromley lost his life in the endeavour to save that of Sandall. This heightens the melancholy of the occurrence, although it is impossible not to admire the heroism of the deed. From the evidence given by Mr. Arthur Bromley, son of the deceased Manager, with whom all must sympathize in the painful circumstances in which he was placed, it seems to be clear that something wrongly done by Sandall was the cause of the gas escaping; and thus resulted in the loss of his own life as well as that of Mr. Bromley. Sandall, it has been stated, had only been at the works about three or four months, and was employed as assistant to the blacksmith, who usually changed the valves, but was absent through illness on the day of the accident. One witness, however, deposed to having seen Sandall change the valves on two occasions. But this did not satisfy the Jury as to his capability for the work; and they added a rider to their verdict expressing the opinion "that, if a practical man had attended to the job, the accident "would not have happened. We think there ought to be a "practical man to attend to the valves; and the evidence "shows that the blacksmith's striker was not a practical "man."

That there is much in the evidence to justify this emphatic expression of opinion, can hardly be denied; nor ought the occasion to be allowed to pass without drawing attention to the manifest duty of employers to entrust only competent men with the control of the various operations of gas manufacture. The safety not of property only, but of valuable lives, depends upon this being satisfactorily performed; and no mere question of wages ought to stand in the way of the best and the most reliable men being placed in positions of responsibility. We are convinced that gas managers, as a whole, do not need any such exhortation; they are only exceptions to whom it may apply. In this particular case, that which had to be done was apparently simple; but the unfortunate man who was instructed to do it did not in all probability understand the consequences of doing it wrongly. He could hardly be supposed to know anything about purifiers, or even valves, much less about either sulphuretted hydrogen or carbonic acid. He went to his doom—so to speak—unconscious of the risk he was running. But why should there have been this risk? Why should so terrible a penalty have been exacted for momentary carelessness or even ignorance? The most experienced are, of course, liable to make mistakes, for they are but human. It is impossible, as everybody knows, to secure safety under all conceivable conditions; but the authorities will doubtless recognize the necessity of obtaining the best advice procurable, in order that arrangements may be devised that shall prevent, as far as practicable, any recurrence of such a tragedy.

Labour Troubles on the Continent.

THE great strike of German miners, which day by day has gathered strength until it has now assumed gigantic proportions, is a menace to the revival of trade which, to all appearances, had commenced both on the Continent and in this country. For though, according to the old adage, "it's "and ill wind that blows nobody any good," and the coal-owners of Belgium and this country will find their account in relieving the shortage of supplies in Germany, the higher prices which must result from any continuance of so exceptional a demand as that which is created by a strike of this magnitude cannot fail to check the development of trade in other directions. The price of coal rules to a very great extent that of iron and steel, consumers of which may be expected to keep off the market as long as possible, in the hope of a return of normal conditions. So far there has not been much movement as regards coal, though freights have appreciably advanced; and the full effects of the strike will not be felt until stocks have become exhausted. At the commencement, there was an impression that a speedy collapse was inevitable, owing to the men being unprepared with funds to bear the strain of anything like a long contest. But already it seems not improbable that if the end does come speedily it will be because the masters rather than the men give way; one of the latest reports being to the effect that about 20,000 of the men are returning to work, having obtained the terms which they demanded. The great majority of the masters, however, appear to be dertermined to concede nothing, and have even gone the length of declining the proffered mediation of the Government, who sent Commissioners to the affected districts for this purpose. The miners have submitted their case to these Commissioners, and appear to have been ready to accept their intervention. This uncompromising attitude of the masters has had the effect of enlisting a good deal of publi sympathy for the miners, without regard to the merits of the matters in dispute. These, in Germany, cannot be kept clear of politics; and the side of the miners is being taken in the Reichstag by the Clerical Party, who, for the nonce, are thus found in concert with the Socialist or Democratic Party. On the other hand, the Conservatives have apparently declared themselves against the miners, on the ground that the latter have broken their contracts.

In a recent debate on the subject in the Reichstag, Count von Bulow, the Chancellor, deprecated this introduction of politics into the dispute, and maintained that the prevailin

dissatisfaction was fostered by political parties—drawing a distinction between German and English Trade Unions, the latter of which were the products of economic conditions. It is, however, pointed out by "The Times" Correspondent, that the Chancellor's observations are in this respect at fault, inasmuch as the German Social Democracy itself is an economic rather than a political party, and has only developed on political lines because the majority of the working classes in Germany have not been able to place any confidence in exponents of the existing order of society such as those Members of Parliament who represent working-class constituencies in England. There is consequently a distinct cleavage between classes, as regards representation, such as has not hitherto obtained to any extent in this county. Moreover, the present conflict has, in the opinion of dispassionate observers, been brought about by sentiment quite as much as the more material consideration of wages. The Westphalian miner feels bitterly that he is not treated by his employers or by their officials in a humane way. The attitude of overseers and inspectors towards the men under them is strongly resented. One of these "tyrants," it is said, disciplines a miner for gazing at him too long; while another kept a deputation of men standing four hours before he would see them. A director of one of the larger works is reported to have said to an interviewer: "The feelings of the people do not concern "me; we do not pay them according to their feelings, but "according to the quality of their work. The miners work "for themselves, not for us."

It is estimated that of the 268,000 miners in the Ruhr district, nearly 220,000 are now on strike. Their demands have been formulated under fourteen separate heads, the principal of which relate to alleged evasions of the mines' regulations by the employers; breach of contract involved in the lengthening of the hours of labour; and the cancelling of payment for trollies containing dross. Complaint is also made of the rate of pay, the daily averages of which for the last four years were 4·80, 3·82, 3·84, and 3·99 marks (shillings) respectively; while the average annual earnings of a miner for 1903 were £60 5s. According to the account by another correspondent, who has examined the wages-books of some of the miners in the Essen district, in some cases only from 60 to 80 marks have been received for 24 shifts. He regards it as impossible that heads of families could live on this low wage. The miners are asking for a minimum wage of from 4 to 5 marks per shift. It is stated that in various instances the men have now to work nine and even ten hours per shift, instead of the eight hours fixed after the strike of 1889; the increase of time being due to the longer distance the men have to go to and from their work. The practice as regards dross appears to be to cancel payment for every trolly of coal found to contain more than about 5 per cent. of dross, though the miner is often unable to distinguish dross from coal by the light in which he has to work. This rejection of coal (most of which is nevertheless sold) has caused a great deal of bitter feeling. On the other hand, the employers contend that they cannot enter into negotiations with the men, since this would give the miners the power of making demands indefinitely.

These are the chief matters that form the subject of the present strife, which apparently a more conciliatory attitude on the part of the employers might have prevented, or at all events have made less bitter. Even if they should be victorious on this occasion, it is difficult to believe that a lasting peace can be ensured under existing circumstances. According to all accounts, this labour revolt had its origin quite as much in social as in economic questions; and for social discontent repression is no remedy. The common bond of humanity cannot be slighted with impunity; nor can its aspirations be disregarded without peril to the State. It is for this reason that the political significance of the strikes which have paralyzed the industries of St. Petersburg and the neighbourhood far transcends the importance of the economic questions involved. They are in reality a protest against the continuance of the bureaucratic government under which—so runs the petition to the Czar—"we are "deprived of our rights, are uneducated, and stifled by des-"potism and injustice." The employers may concede an eight-hour day and the other privileges asked for; but unless the Czar grants some measure of freedom, the crisis may be postponed, but it cannot be permanently averted. The terrible events which are happening in the Russian capital can have only one ultimate result.

The Industries and Technical Instruction.

THE complaint that other countries are taking the lead in industrial progress through the greater facilities afforded to the people for acquiring technical knowledge, will have to be somewhat modified, judging by the Blue-Book issued on Wednesday last, which supplies an account of the expenditure devoted to technical education in this country during 1902-3. It is shown that the amount disbursed for this purpose in England and Wales in that year reached the grand total of £1,191,998. This does not include the sums appropriated for intermediate and technical education under the Welsh Intermediate Education Act, 1889. Further, it is brought to notice that, on the security of the local rates, £149,665 was raised by loan under the Technical Instruction Acts—making the total amount of loans outstanding £1,159,941. The balance in hand of money received and allocated to technical instruction was £598,989. The bare reference to these large sums is sufficient, without going deeper into the figures, to disclose the great amount of attention that is being directed in these days to the subject of technical education; but they do not afford satisfaction on the important point whether the country in return for this considerable expenditure is realizing an adequate benefit. There is something problematical about this in the minds of many thinking people. Therefore it would not be amiss if there was an early inquiry as to whether or not the results do justify the expenditure; and, if not, whether some different methods of utilizing the latter would not yield greater advantage. We could mention two or three districts where public money is being expended in technical instruction, and the attendance at the classes certainly is not in correspondence with the expenditure involved. In such cases, no doubt, cheaper methods could be found for giving technical education to the handful of students who attend the classes. We should be the last to deny to really willing and earnest students their opportunities for advancement; but it would be a satisfaction to learn that, in the opinion of experts, the large and growing expenditure for this purpose is being made in the best possible manner. It would be of interest to know, too, whether the industries of the country are feeling any decided benefit from the outlay. We feel some confidence in saying that, if grants could be made from this money to the technical organizations connected with the gas industry, for specialized instruction for the students of the industry, great good would ensue. This would also apply to all the other industries. The schemes under which technical instruction (through public funds) is imparted show too much, both in their arrangement and in their direction, the narrowness of the educationalist and scientist, and not sufficient of the leaven from minds practically trained in the methods and requirements of our great industries. This is what is essential to achieve the greatest good; and it could be obtained by taking counsel with the country's chief technical organizations. If the complaint to which reference was made in the opening lines is still justified, it can only be because the facilities afforded are not of the best order for beneficial productiveness.

Law-Assisted Co-Partnership.

WE are indebted to the Editor of "Labour Co-Partnership" for a copy of the issue of this publication containing an article upon the proposals which are before the Legislature of Massachusetts, having for their object the promotion of co-partnership by a change of the law, and with regard to which the report of a Committee appointed to consider them has been made public. Two Bills were introduced—one to establish co-partnership compulsorily, and the other to facilitate voluntary agreements to be made between employers and employed.

The compulsory Bill proposed that any company with limited liability and working for the sake of profit should in the first place be entitled to pay a dividend not exceeding 5 per cent. on the market value of the property employed in the business; and, next, to accumulate two reserve funds, together not exceeding 10 per cent. of the market value of such property, for repairs, renewals, depreciation, and arrears of dividend. The extra earnings beyond these are to be divided between the employees and the company, in the ratio which the total ordinary wages earned during the period bore to the total ordinary dividends for the time being. Thus the greater part of any profit above the 5 per cent. and the allocation to the reserve funds would

be diverted from the shareholders to the employees, since the wages paid during the year in most cases very greatly exceed 5 per cent. on the total capital employed. While, therefore, in case of non-success, the shareholders would be the losers, they, in the event of success, would probably not get more than about 6 per cent. for their investment. Inasmuch, moreover, as the proposal was not to apply to private employers, the effect of it would be to put a premium upon private businesses, and tend, not to introduce profit-sharing, but to discourage the formation of companies. Legal compulsion in this or in any form could not secure that spirit of mutual consideration and united interests which is the very essence of true co-partnership, and without which the latter would exist only in name. Both sides must see and recognize that the scheme is for their mutual advantage; otherwise there can be no proper cementing of the interests of capital and labour. Such a proposal would be impracticable as regards gas undertakings—not only because it holds out no inducement to reduce the price of gas, but also because no provision seems to be possible with respect to the premium capital employed; at the same time it would be a direct incentive to reduce the labour bill by employing, to the greatest possible extent, labour-saving machinery.

The other Bill may be regarded as a substitute for this drastic compulsory proposal. It is simply an enabling measure, and purely optional in its application. Any employer, whether a private individual or a company, might with ten employees decide acceptance of the Act; in doing which they must agree upon rates of ordinary wages, and also upon a rate of ordinary dividend, whether more or less than 5 per cent. After making these payments and providing for reserve funds, the surplus profits were to be divided between capital and labour, as already described. As an inducement to employers to come under this voluntary law, the Bill proposed that, by doing so, their liability for debts should be limited to the capital actually employed in their business, and also that they should have special privileges as to insurance against employers' liability for accidents.

The Committee in their report take objection to both the proposals, and further declare that "the Bill adds nothing to "the powers already existing for the establishment of systems "of profit-sharing." This observation would be equally correct if it were applied to this country, where, however, it has been found that legislation can do much to promote co-operation, not only in regard to the encouragement of thrift by means of savings banks and industrial and provident societies, but also in removing legal prohibition, reducing law costs, granting facilities for voluntary organization, and securing audit and publicity as guarantees of financial soundness. The voluntary organization of co-operative production, and also the cause of industrial partnership between employers and employed, are, it is believed, going forward steadily and surely, if slowly—surely, because founded upon voluntary initiative. As education spreads, it is to be hoped the movement will gather force; but any attempt to extend it by legislative enactment can only result in disaster.

The "Question-Box" Confiscated.

A fortnight ago, we advised the members of the District Associations that the Editor of the Ohio Gaslight Association Question-Box (Mr. Henry L. Doherty, of Denver) was making use of the "JOURNAL" office for the distribution and collection of the first list of questions for the 1905 volume, until the methods of active co-operation direct with the Associations had taken definite shape. Further, readers were led to expect that they would be almost immediately receiving the copies of the circulars. We wrote then without (in making a fair allowance for delay through the ordinary perils that beset passage from Denver to London) taking into the calculation international laws, and such regulation bound bodies as the Customs and Postal Authorities. It seems that our friends of the Ohio Gaslight Association committed unconsciously a most serious offence, with the sole object of ensuring that the lists of questions should safely reach their destinations. They placed the lists in envelopes, and addressed them (this will account for certain peculiarities in the addresses); and then packed the whole in a large box, and shipped it to the "JOURNAL" offices. There was no question of saving expense in adopting this course. The circulars could have been sent each for a halfpenny from America—the postage we should have had to pay in this country on receiving the case. So that it will be seen—in order that the addresses might, for safety's sake, be scrutinized in this office—Mr. Doherty went to greater expense than otherwise would have been required. But this does not palliate the offence. Trouble commenced on the arrival of the case at Liverpool. The Customs authorities opened it, and found that, in the addressing of the envelopes by our friends in Denver, there had been an unpardonable infraction of international law and treaty, by which violation the American Post Office had been defrauded of their halfpenny postage on each packet. Thereupon, the ponderous machinery of the Customs authorities and the Post-Office was set moving. The former seized the case, and handed it over to the tender care of the Postal Authorities; and so the contents became, for the time being, the property of the Postmaster-General, instead of the gas engineers of the United Kingdom.

Last Thursday morning—*nearly a fortnight after* the case must have reached Liverpool—we were informed, by "direction of the Postmaster-General," of the fate of the long-expected lists. The communication told us that the importation of correspondence into this country otherwise than through the post was contrary to law, and that for such an offence there is a penalty, which, we also discovered, is £5 for each packet. As there were 881 of these addressed circulars, the total penalty would not have been an insignificant amount, and would have made the "Question-Box" of 1905 rather an expensive matter. Besides this, the letters were liable to be sent out for delivery as addressed, charged with double the postage which would have been prepaid in the United States—that is to say, in all £3 13s. 5d. Then—this looked ominous—the letter proceeded: "Before further action is taken in the matter, the Postmaster-General directs me to ask whether you have any explanation to offer." A representative of the editorial staff ventured soon afterwards into the official presence, and explained the nature of this little effort at technical co-operation between America and this country; that the violation of laws and treaties had happened unwittingly; and that it had not been a question of saving expense, but of assisting the Post Office by revising the addresses that had brought about the trouble. The Postal Authorities accepted the explanation; and, by payment of double the postage from America, the carriage of the case by mail train from Liverpool, and cartage expenses from and to the G.P.O., the circulars were released, and by this time those of our readers to whom they were addressed have received their copies. After this recital of the adventures of the lists of questions, we must ask the recipients not to keep them as mementos of a journey so full of incident or as curiosities, but to do all that is possible in the way of replying to some of the questions (*ante*, p. 79), so that we can ship the replies to Mr. Doherty on **Monday, Jan. 30,** instead of Jan. 25. We did all that was possible to secure their freedom as soon as we learnt that the leisurely ways of bureaucracy were keeping the lists from their proper destinations, and hope, therefore, that the recipients will help us now by a little expedition, and not allow our American friends to be disappointed through an innocent infraction of the law. We should like someone to explain how it is the paths of State officialdom are so tortuous that it takes a fortnight or thereabouts, after a case is delivered at Liverpool, for the consignee in London being informed of its "seizure" in this manner. However, if any reader has not received a copy of the list of questions, and desires one, a post-card will ensure its immediate postage.

Compensation to Directors.

The amount of compensation to be paid to the Directors and officials of companies whose undertakings are acquired by local authorities is generally a delicate, and not unfrequently a difficult, question to settle. This is found to be the case even with small concerns; and therefore it is not surprising that it should be so when the properties transferred are of the magnitude of the waterworks of London, and the parties to be dealt with the gentlemen who for many years had control of them. It was evidently anticipated that there would be some trouble in adjusting the claims made upon the Water Board by the Directors of the several Companies, for in the Metropolis Water Act, 1902, provision is made for the appointment of an arbitrator by the Local Government Board to fix the amount to be paid, failing agreement. In only one case—that of the East London Company—was an agreement

come to; and consequently the authorities at Whitehall had to nominate Lord Revelstoke as Arbitrator. The results of his labours are shown in the report presented by the Special Arbitration Committee of the Water Board at the meeting of that body last Friday. The document is given in full in another part of the "JOURNAL" to-day, together with the tabular statement accompanying it, and therefore it is unnecessary to go into any of the details here. It may be of interest, however, to indicate briefly the chief points. Altogether, the revised claims amounted to £316,726, and, as already mentioned, only one, which was for £35,895, was agreed. The Arbitrator consequently had to deal with seven claims, to the aggregate amount of £280,831. In the result, he awarded the sum of £201,868. There was, however, a legal question raised in connection with the Kent Company's claim, which will have to be settled by the High Court. Should there be a reversal of the Arbitrator's decision in their case, the award will be increased to £202,670. It will be seen from the table that the total average annual fees paid to the Directors of the seven Companies amounted to £25,051; but as the Directors of two (the Grand Junction and West Middlesex) represented them upon the Staines Reservoirs Joint Committee, £989 had to reckoned for their fees—bringing up the total to £26,040. The average was made on the basis of five years' annual fees; the award is equal to 7·6 years' purchase of the lower amount, or 7·3 years' purchase of the higher one, *plus* 5 per cent. for income-tax. The report and the table constitute one of the most comprehensive and informative documents ever issued, so far as we are aware, on the subject of the compensation of directors; and it is for this reason that it has been reproduced in its entirety in our columns.

Brickmaking in Gas-Works.

In the inauguration of a brickmaking plant last week, the Plymouth and Stonehouse Gas Company are to be congratulated on being the pioneers of a new system of dealing with gas-works waste. Though they are in the centre of an agricultural district, the Plymouth Company have had their share of the difficulty of disposing of spent lime, and perhaps more than ordinary trouble in getting rid of the clinker from the furnaces. In the winter months there has been more or less demand for the lime for manuring purposes; but in the summer, farmers seem to have very little use for it, and a good deal of it and of the clinker has had to be dumped into the sea, or disposed of in some other equally unprofitable way. The bricks into which these residuals are now converted will no doubt find a ready market. Though they are admittedly unsuitable for outside use, they are at least equal in quality to the average common bricks employed for inside walls and similar work. Some we have seen are, indeed, vastly superior to the majority of the red clay bricks in use, and but for their greyish colour might be utilized for any ordinary building purpose. It remains to be seen whether the financial results justify the outlay of capital and the cost of converting these ultimate residuals of carbonization and purification into saleable products. If they do, there will no doubt be a considerable addition to the stock of building materials in the country. One merit which the process possesses is that it is compact, and does not cause nuisance of any kind. The quickness of the operation is another recommendation, for it enables bricks to be made ready for sale in 24 hours—an obvious advantage in the busy season at gas-works, when refuse accumulates rapidly.

The Rating of London Boroughs.

A statement compiled by the Borough Accountant of Deptford is very instructive in respect of the information it affords concerning the rating of each of the 28 boroughs forming the County of London. It is undoubtedly the most complete return of the kind that has yet been issued. One thing it shows very clearly, that the possession of marketable assets or "remunerative" undertakings does not necessarily mean low rates. Profits "in aid of the rates" look very nice; but it is a peculiar fact that some of the heaviest rated boroughs in London and the Provinces possess property yielding profit. In London, according to this compilation, the highest rated boroughs are: Poplar, with 9s. 8d.; Bermondsey, 8s. 10¾d.; Stepney, 8s. 5d.; and Camberwell, 8s. 1d.; The lowest rates levied are: Kensington, 6s. 5d.; Stoke Newington, 6s. 6½d.; Paddington, 6s. 7d.; Westminster, 6s. 8d.; and Finsbury, 6s. 9d. The remainder of the boroughs, of course, come between these figures. We would not be so uncharitable as to assume that the possession of electricity supply undertakings has anything to do with the high rates. But looking into the matter, it is rather singular that the three boroughs at the head of the list have electric light undertakings of their own, while all, with one exception, of those which stand at the bottom have left the supply of electricity to private enterprise. The exception is Stoke Newington, whose electricity works, however, are not many months old. There is the Poplar Borough Council, for instance, who (according to the latest available returns) have spent £194,301 on electricity works. The ratepayers there are called upon to pay 9s. 8d. in the pound; while on the electricity undertaking, they had a surplus profit in 1903-4 of £2985, after providing for interest and sinking fund. Then Bermondsey, which comes next with 8s. 10¾d., have expended on electricity supply £69,266, and had in 1903-4 a surplus of £509; while Stepney, following with 8s. 5d. in the pound, have spent £199,129 on electricity supply, and had a surplus for the year of £5936. But coming to the other end of the list—to those boroughs ranking lowest in the weight of their rates—there we have Kensington, Paddington, Westminster, and Finsbury who have not troubled their heads about undertaking electricity supply on their own account, all with low rates. We do not suggest any connection between these facts; and the electricians are quite at liberty to apply any convenient explanatory phrases they like to them—such, for example, as "purely a coincidence." But "electricity profits" is evidently not a term that is synonymous with "low rates."

Gas Consumers' Literature.

Among the latest of the informative literature which the Gaslight and Coke Company have issued to their consumers we find a couple of circulars and a catalogue of fittings. Local illustration is usually the most effective in assisting to an appreciation of truths concerning lighting matters; and we find in one of the circulars that, when a consumer of electricity wrote to the "Fulham Chronicle" complaining of the method of charging for current adopted by the Borough Council, the Gas Company utilized the complaint for a useful little lesson, which will appeal very forcibly to the residents in the Company's area of supply generally and particularly to those in the Fulham district. The correspondent in the "Fulham Chronicle" wrote: "Go where you will in Fulham, you will see shops with electricity fitted (often at great expense), but with gas burning because electricity is far and away more expensive and very much less illuminating than gas. . . . In 1903, I reduced to 700 units—cost £14—and now I suppose I must refit and return to the Gas Company." The consumer certainly suggested the best remedy, as the Company show as follows in their circular: "For his consumption of 700 units, he obtained—if he always kept his lamps in good condition—a total light during the year equal to not more than 200,000 standard candles, probably less. Using incandescent gas-burners, he could have got 500,000-candle power for a consumption of 25,000 cubic feet of gas, costing, at 2s. 11d. per 1000 cubic feet, £3 12s. 11d. If he had used ten burners to get these results, the Gas Company would have kept them in thorough order, and supplied new mantles and chimneys when required, for the sum of £1 10s. Cost of 200,000-candle power obtained by electricity (excluding cost of lamp renewals) would be £14; cost of 500,000-candle power obtained by gas (including mantle renewals) is £5 2s. 11d. The consumer would, therefore, had he followed the example of his neighbours and used gas instead of electricity, have saved £8 17s. 1d., and had a much better light." The second circular gives the independent opinion of "The Lancet" on the subject of "Gas *v.* Electricity;" this being a reprint of an article that appeared in our medical contemporary for Nov. 26 last, and was suggested by the International Gas Exhibition. Regarding the catalogue of gas-burners, lamps, and other fittings, we have always been strong believers in the efficacy, in the preparation of such literature, of good taste—both in the "get-up" and in the selection of the matter and illustration. A little extra spent on high-class paper and artistic printing well repays, through the attention that anything uncommon always has bestowed upon it. The Gaslight and Coke Company have, especially during recent times, fully appreciated this, with the result that their catalogue is very choice in all respects, so much so that those who receive a copy are almost certain to preserve it. The forty leaves (or 80 pages) of the catalogue are bound up on the Stolzenberg file system, in dark green covers, with an ornamental device in light green and gold on the front, and bearing the words "A Catalogue of Fittings for the Best and Cheapest Light." The illustrations are excellent.

WATER AFFAIRS.

Water Legislation for Next Session.

We complete to-day our notices of the Bills relating to water supply which it is intended to introduce in the forthcoming session; and we think it will be acknowledged by those who have perused them that they do not justify the anticipation that the parliamentary committee-rooms will be the battle-grounds of contending parties over very many matters relating to this branch of the public service. Now that the Metropolitan Water Question has been settled, the sessional work has not been marked by the keen contests which for some years characterized it; and, with the exception of a few ebullitions, it has been got through fairly smoothly. It would be almost too much to expect, however, that London water would be out of Parliament for more than two or three years in succession. Indeed, the Water Board are bound by the terms of the Metropolis Water Act, 1902, to introduce, within three years from the 24th of June last, a Bill providing for uniform scales of charges applicable throughout their limits of supply. In the meantime, something may be heard of them next session in connection with the Bill which the Conservators of the Thames are promoting to obtain powers for improving the channel and bed of the river; for authority is sought therein to move from Teddington up to Molesey Weir, as soon as this is ready, the point of measurement of the water taken from the river below Penton Hook for the supply of London. As, however, power is also asked to enter into agreements with the Board, the latter may not offer any serious opposition to the Bill. A very different condition of things will be witnessed in regard to another river which will come under the notice of Parliament next session—viz., the Wye. When the Birmingham Corporation obtained the Act enabling them to carry out their Welsh water scheme, they agreed to send down the river 27 million gallons of water daily as compensation. Now that the scheme has been so far completed as to allow of the water being supplied to the city, the Corporation are seeking to reduce the amount of compensation to 20 million gallons. The extra 7 million gallons would, no doubt, be a welcome addition to Birmingham's store of water; but the inhabitants of Central and South Wales regard most unfavourably the proposal to appropriate it, and there is every appearance of strong opposition being offered to its enactment. The flow of the river even now is not abundant; and therefore any diminution in its bulk would be very prejudicial to the riparian owners. In this case the Conservators of the river have already made an agreement with the Corporation; and their action has aroused local indignation which will be pretty certain to find expression at Westminster. This, however, is practically the only legislative proposal which seems likely to cause serious trouble.

Speaking generally, new works, extensions of limits of supply, and powers for the protection of the water, are the principal features of the Bills. The Bolton Corporation have a big scheme in contemplation, for which they want £752,000; and other local authorities require authority to carry out works of less magnitude. Parliament will be asked to incorporate a Company to purchase the waterworks of the Earl of Scarborough and supply Skegness; to permit the dissolution of the Thames Valley and Goring Water and Gas Company, and its re-incorporation as the South Oxfordshire Water and Gas Company with greatly extended powers; and to authorize the carrying out of additional works and the enlargement of the area of the Sunderland and South Shields Water Company. Extensions of the time specified for carrying out works already sanctioned are applied for in several cases. The Accrington Water Board wish to purchase distributing plant from the Burnley Rural District Council; and the Southport, Birkdale, and West Lancashire Water Board have a similar desire in regard to some now in the possession of the Earl of Derby. Purchases of this kind and extensions of works and areas entail the employment of more money; and the necessary permission to raise it, under the conditions now usual, is applied for in the majority of the Bills. In two instances—Bangor (Co. Down) and Blackpool—provisions are included in regard to the supply of sea water. In the former town new works are proposed; but in the latter, only an extension of the area to which the special powers already granted for this service apply. This is to be regarded as a quite distinct undertaking, and a separate account is to be kept. Among the miscellaneous provisions of the Bills, one may be mentioned by which the Colne Corporation will be enabled to allow a discount up to 5 per cent. for prompt payment of accounts; and another which empowers the Heckmondwike Corporation to make the owner of the premises, as well as the parties supplied, liable for certain expenses payable under their Act of 1876. The latter Corporation will also ask that the powers granted in respect of premises within their area shall be applicable to those which are partly outside; and that they may put up and maintain drinking-fountains and cattle-troughs. As already remarked, the proposals of the Bills do not, on the whole, appear to be fruitful of much contention before Parliamentary Committees; and therefore the session will probably not be very eventful, so far as Private Bill business is concerned.

Report of the Gaslight and Coke Company.

The following is the report of the Directors of the Gaslight and Coke Company for the half year ended Dec. 31, which, with the accounts for the same period, will be submitted at the ordinary general meeting on the 3rd prox.: "The accounts for the past half year show that, after providing for the fixed charges, and setting aside £10,000 for the half year towards the redemption fund, in accordance with the provisions of the Company's Act of 1903, there remains a balance, including the amount brought forward, available for distribution, of £583,543, out of which the Directors recommend a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, which will absorb £335,350 8s., leaving the sum of £248,192 12s. to the credit of the current half year. The dividend paid for the corresponding half year, 1903, was at the same rate, and the amount then carried forward was £175,417 5s. There is a decrease in the amount of profit earned during the half year, as compared with that of the corresponding half year, of 1903. This has been brought about by the reduction of 1d. per 1000 cubic feet in the price of gas, which was made on the 1st of July last, and by the reduced revenue obtained from residual products. The quantity of gas sold during the half year shows an increase of 2 per cent. over the quantity sold during the corresponding period of 1903. There has also been an increase during the half year of 14,949 automatic meter consumers and of 2377 ordinary consumers. An important event of the half year was the holding of an International Gas Exhibition at Earl's Court, during part of November and December, under the auspices of the Institution of Gas Engineers. The Directors made special efforts to support the exhibition; and they are pleased to find that it was a complete success, and that much good is likely to result to the gas industry from this display of modern gas appliances. The Directors have established a superannuation fund for the officers of the Company, which came into operation on the 1st of January of this year. They have no doubt that this fund, to which both the officers and the Company contribute, will be an advantage alike to the staff and to the Company. The parliamentary session which is about to commence will apparently be one of great importance to the Metropolitan Gas Companies. A Joint Bill has been deposited by the three Companies, to give effect generally to the recommendations of the Departmental Committee appointed by the Board of Trade to inquire and report as to gas testing in the Metropolis. The clauses of the Bill will be explained to the proprietors when, in compliance with Standing Orders, it is submitted for their approval at an extraordinary meeting which will be held immediately after the close of the ordinary meeting. The London County Council have also deposited a Bill with a similar object. In addition, however, their Bill provides for a reduction of 1d. per 1000 cubic feet in the standard price of gas of the three Companies respectively. The Directors, in view of the fact that this provision is contrary to the expressed view of the Departmental Committee, and that a settlement involving a large reduction in the standard price was arrived at in the case of this Company so recently as the year 1903, have resolved to oppose the Bill. There are several other Bills before Parliament likely to affect the Company's interests, which will be watched with a view to obtaining the necessary protection.

Societe Technique du Gaz en France.—As usual, the French Gas Society announce early in the year the date of their annual meeting, which, as previously stated in the "Journal," will be held this year at Havre, under the presidency of M. Visinet. The congress will begin on the 20th of June, and be continued on the following three or four days. The last date allowed for the sending in of competitive essays (which, it will be remembered, are not limited to members of the Society) is March 1; and all papers to be read at the meeting should be forwarded to the offices, 105, Rue Saint-Lazare, Paris, not later than May 21. Ample time is thus given to intending contributors; and we have no doubt that the forthcoming meeting will be as successful as those of any previous years.

THE SERVICES OF THE LADY LECTURER AND TEACHER.

Do gas companies and gas committees of local authorities make the most of the services of the accomplished lady cookery lecturers, demonstrators, and teachers who are prepared and wishful to assist them; and, if not, how best can their talents be exercised for the behoof of gas suppliers? These are questions that crossed the mind as the exceedingly popular demonstrations at the Earl's Court International Gas Exhibition drew the writer among the throng to watch the deft fingers and hear the persuasive eloquence of the ladies to whom was confided on this important occasion the exposition of the art of dressing and preparing food by the aid of the gas-range; and the mind has since more than once been similarly interrogated. In regard to the first question, consideration inclines one to the opinion that gas companies and committees are not making the fullest use of these ladies. The expression of the opinion rather carries with it the duty of giving answer to the second question. But the writer must confess that his qualifications are not precisely of the order that will permit of an immediate and complete reply being tendered; and therefore it is proposed (believing that good may accrue) to invite these skilled ladies to give their views on this subject—that is to say, how and in what ways they, trained in cookery and in the manipulation of gas-stoves, can be of the greatest assistance to gas suppliers. However, to serve as an introduction for, and give a lead to, discussion, perhaps a few general observations may be made.

Time was—we are speaking now of the years following the invention of the first and somewhat crudely formed gas cooking stoves—when there were no lady cookery lecturers identified with the gas industry, for the reason that cooking by gas was not taken to very kindly by the public. Then, if memory serves rightly, during the eighties and later a little band of ladies specialized in cooking by gas, and did a vast amount of good in convincing the public that their suspicions regarding the use of gas-stoves were ill-founded. From that time onward the use of gas for cooking purposes has proceeded apace. It has indeed been a remarkable development, as the "peak of the load" of some gas undertakings synchronizing with the preparations for Sunday dinner conclusively testifies. Popular though the cooking-stove is, wonderful as has been its adoption, yet it would not be strictly true to describe it as ubiquitous, nor the hire system under which its use has been so largely spread as absolutely perfect. The misuse and wear and tear of the stoves are too great for this to be admitted. These points agreed, it follows that there is yet abundant room for the further popularization of gas cooking; much to be done in the way of teaching and engendering proper methods in using stoves; much to be done in extending the application of gas in the work of the house; and consequently there should be still a great request for the services of the qualified lady demonstrator in the domestic uses of gas. The little band of gas cookery lecturers and teachers has grown to such a remarkable degree, through the various training-schools, that the supply of really competent ladies (bearing diplomas by examination) for this purpose now, it is feared, greatly exceeds present demands; and in consequence many of them unfortunately are frequently to be found among the "unemployed." The demand for their services, however, can only be extended by showing gas companies and gas committees how those services can be further applied in the interests of their undertakings.

The measures taken for the propagation of knowledge on the subject of gas cooking in this country have, speaking generally, been of a one-branched character, and somewhat monotonous in their remarkable similarity—consisting for the most part of a small exhibition of gas-stoves, and lectures by ladies, who have, it may be noticed in passing, been more frequently than not retained at the expense of the gas-stove makers. The lectures, as such, have been all that could be desired, the ladies demonstrating have been courteous and anxious to interest and educate, and their productions have been such as would delight the heart of the epicure, and meet with the unreserved approval of the connoisseur. They have, in fine, succeeded so far as they have been enabled and allowed to go; but there—again speaking generally—the demands on their services have ended. Lectures and cookery demonstrations, one is afraid, are played out without other attractions are provided; but those "other attractions" need be only of a simple kind. Earl's Court perhaps furnished one cue. Quick-cookery competitions for prizes and certificates and the children's competitions were powerful attractions which, blended with the ordinary cookery demonstrations in any town, would, it may be imagined, under the direction and umpirage of the expert lady cook, have an equally good effect worked up for the evening lectures, while the afternoon lectures might still be devoted to high-class cookery, with, at all times, the diffusion through the lectures or competitions of sound advice as to the rational treatment of gas ranges and their appurtenances.

The desire here is not, however, so much for the consideration of the question of the occasional utilization of the services of these ladies accomplished not only in the art of cooking by means of gas-stoves, but possessing the facility—nay the gift—of oral expression before an audience so that all can understand, as the consideration of the idea of creating, with mutual benefit, further scope in which they can exercise their talents. In short, the point is as to whether the attachment to the staff of a gas undertaking of a lady trained and experienced in cookery, and in teaching the proper methods of using and respectfully treating gas-stoves, cannot be profitably made in the case of every gas undertaking of moderate and large size, and in the case of small ones by a number of them in a convenient district uniting for the purpose of the engagement. In addition to public lecturing, three ways may be advanced purely as suggestions—and it is hoped others will be forthcoming—in which the addition of a lady to the staff of a gas concern or concerns might produce very advantageous results—

(1) For systematic visiting, inspecting, and advising.
(2) For making arrangements to give, at the entire expense of the gas company or gas department of the local authority, free lessons (say) weekly at all the girls' schools in the district.
(3) For co-operating in the same manner with churches, chapels, and other organizations (even factories) connected with which there are institutions for mothers and young women.

In every district, there are schools and places of worship; and it cannot be conceived, if the total expenses be borne by the gas undertakings, that there would be any difficulty in connection with a development of this kind in the measures for popularizing the use of gas and—this is of immense importance in these days of hiring-out—cultivating care and cleanliness in the use of gas-stoves. If the latter only could be done, would there not be a material difference in those at present substantial items "wear and tear and maintenance of gas-stoves" and "depreciation?" The possible savings in expenditure under these heads would make the payment of the salary of the lady whose agency and teaching produced the savings a really pleasing and profitable investment.

The suggestion as to periodical house visitations by a lady qualified to instruct, inspect, and give advice, has been made before; but in this country, to the best of our knowledge and belief, the idea has never been thoroughly tried, nor even entertained. The Englishman's house is his castle; and so it is of the Englishman's wife. And because of it the gratuitous assumption appears to have got abroad that the lady of the house would regard an inspection and offer of advice as little short of impertinent, and resent it accordingly. This may be true in cases; but one has a fair amount of confidence in saying that just among those classes of consumers where inspection and counsel and assistance are most required, there would the courteous lady emissary of the gas company or gas department be welcomed. Among other classes of consumers, too, those houses where the visits would not be acceptable would, it is fancied, be of the minority. Grace, tact, and diplomacy are wonderful factors in dealing with the irascible and those who suffer from inordinate self-esteem. Why the educated and refined lady charged with duty and a mission by the gas suppliers should not be as welcome as the clergyman or the district visitor, and more so than—let us say—the tax collector, cannot be divined. Certain it is that the practical minded housewife or cook would be glad of opportunities for discussing matters occasionally with the lady "expert." The advantages accruing from inspection and advice would be mutual. Any little grievance, or any little repair could be—the former immediately dealt with, and the latter noted for report. Satisfaction on the part of the user with the cooker and other appliances would be maintained; and the knowledge of the visitor in respect of the regulation of the oven and other similar matters, and suggestions as to the preparation of special dishes, should make the visits the more acceptable. The saving to the gas suppliers through increased cleanliness and carefulness, and the better preservation of the stove, would not be an inconsiderable item, having in view when writing the terrible state of many samples of returned stoves seen at different works. The lady cook as an inspector, house-to-house instructor, canvasser, and defender generally among the ladies of the interests of the gas suppliers does not look such an impossible creation and success as some apparently believe; and trial of the proposal under several circumstances would have to be made before the writer would be prepared to condemn it.

The suggestion, however, as to the undertaking by gas suppliers of free cookery instruction (with gas-stoves) in schools and other institutions takes the fancy, and appeals very strongly for support. It is believed that a vast amount of good might be done in every town in this way. In London, there are several girls' schools where cookery is taught; and one of the most interesting features of the cookery demonstrations at the late Earl's Court Exhibition was the competition among girls from certain of these schools. The proficiency the children (whose ages ranged from 10 to 15 years) had acquired in the handling of gas-stoves was the subject of much admiration. But girls' schools where cooking forms part of the curriculum do not exist in every town; and it is to the interest of gas suppliers to see—if it can possibly be arranged—that classes are brought into existence, and without cost to the owners or managers of the schools. A skilled, patient, and cheerful teacher would have great influence among the children, and would inculcate much that would be of service to the children in their present and future homes, and peradventure to their parents. Certain it is that "what teacher said" would

produce a greater solicitude for the safety and cleanliness of the stove at home; or, if there was not one there, the influence of the girls might assist one into position. But if these girls cannot have a stove in their present homes, they will not be satisfied, after their training, without one when they have homes of their own. The third suggestion, too, is one that might be usefully developed.

These are believed to be directions in which the services of the trained lady cook, lecturer, and teacher can be further utilized in the interests of the gas-supply business. Resource seems to have been expended with the exhibition of gas stoves and ordinary cookery lectures and displays; but there should be no difficulty, it seems to the writer, in finding fresh ways and means for cultivating a greater knowledge of the uses, together with better care, of the gas-stove. The more work having an educative influence there is accomplished in a town or district, the wider will spread the use of gas for cooking and heating purposes; and, in a commensurate degree, the base on which stands the business of the gas industry in each of such towns or districts will be enlarged and fortified. In this work cannot ladies specially trained take an important part? On the surface, there is no reason why they should not. Perhaps now some of them will supplement or criticize the suggestions here presented.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 249.)

THE Stock Exchange has had a disappointing week. Things were rather uncertain at the opening; and the weakness of the position rapidly intensified until a pronounced degree of flatness was reached. Recent rises had evidently been too much forced; and the basis of advance was not solid enough to stand an adverse blow. Apprehension of trouble arising in international relations was the chief factor; and sensitive markets shrank in sympathy. In the Money Market, the movements were irregular and hard to follow. The tendency at first was easy; later on it hardened; and finally it closed with an inclination to ease again. Discount rates, too, were unstable. Business in the Gas Market was scarcely on as large a scale as we have seen during recent weeks; and on one or two days it fell very quiet indeed. The general tendency may be quoted good and improving, despite a notable instance of movement in the opposite direction. Several issues made fair advances in quotation. The conspicuous exception was Gaslight ordinary, which, after going strong for the first three days, had a smart drop on Thursday, when the Directors' announcement of the next dividend became known. This showed that the Company were some £25,000 short of maintaining the position of six months ago; and the foggy Christmas week had unduly exalted the public expectation. So the quotation fell three points, and transactions showed a range from 103⅞ down to par. The secured issues came in for more than their fair share of the influence—the maximum marking 93 to 94, the preference 110 to 110½, and the debenture dropping from 88½ to 87. South Metropolitan was rather quiet. It opened and closed with a mark of 133½, touching 134½ intermediately. The debenture was done at 88. Commercial was very quiet; the 3½ per cent. only being dealt in at 114¾ and 115. The Suburban and Provincial group were strong. Alliance old realized 21½, Brighton original 232½, and ditto ordinary 171. Bromley "B" marked 94½, West Ham 102, and ditto preference 123¼ and 124. In their local Exchanges, Newcastle was a shade easier; but Liverpool debenture rose a point. Not much was done in the Continentals. Imperial shrank a point, changing hands at from 212 to 213½; Union marked 119 and 120; and Europeans of both issues advanced, with dealings at 21½ and 21¾ in the fully-paid and 14¾ and 15 in the part-paid shares. Tuscan shares were done at 8⅞, and Malta at 4 5/16. Among the undertakings in the remoter world, there were several advances. Cape Town marked 16½ and 16⅝, ditto debentures 51½, and ditto debenture stock 101½. Bombay new marked 4 11/16. Buenos Ayres realized 11⅝ and 11¾, and ditto debenture 94½. River Plate ranged from 12⅛ to 12 5/16; and San Paulo marked 12¼. Primitiva marked 5⅝ and 5 13/16, ditto preference 4 15/16 and 5 1/16, and ditto debenture 94⅞ and 95.

The closing quotations are shown, as usual, in our stock and share list, p. 249.

A stone masonry dam, 141 feet high, forms part of the waterworks of Solingen, in Rhenish Prussia. The length is 125 feet at the bottom and 585 feet at the top; its thickness at the foundations is 120 feet, and at the crest 14 ft. 9 in. It is curved against the water impounded on a radius of 492 feet.

An interesting demonstration of how gas is manufactured was given by Mr. H. Buckley, the Engineer and Manager of the Windsor Gas Company, to the members of a local Debating Society, who visited the works a few days ago. The whole process was fully explained to the visitors, and the latest appliances for the use of gas were exhibited. At the conclusion of the visit, a vote of thanks was accorded to Mr. Buckley for devoting a whole afternoon to showing the members of the Society over the works and initiating them into the mysteries of gas making.

ELECTRIC LIGHTING MEMORANDA.

Electrical Contractors and Free Wiring—Principles Sacrificed to Self-Interest—Electricians and Refuse—Electric Lighting and Fires: A Journalist's Assertion and its Contradiction.

IT has already been announced that the London County Council have inserted in their General Powers Bill clauses to enable the Metropolitan Borough Councils authorized to supply electrical energy to expend money upon the wiring and fitting up of the houses of their consumers or prospective consumers; and several local authorities who are beyond the operations of the guardian angel of Spring Gardens are seeking to be allowed to exercise their venturesome spirit in like manner. It will be remembered that the Electrical Contractors' Association were successful in opposing a similar legislative proposal by the London County Council in 1903; and they are again putting on their armour for a renewal of the struggle in the coming session, which struggle is going to be more serious than anything of the kind the Association has previously undertaken in this way. Several members of Parliament have already pledged their support to the Association's opposition. It is recognized that the effect of the granting of the power asked by the County Council would not be confined to the Metropolis, as the success would be an awkward precedent for the Association to face in any further hostile action against the utilization of the ratepayers' purse in the proposed manner. The Association, too, do not ignore the fact that they have here a powerful adversary, and a relentless one as is disclosed by correspondence which has passed between the Hon. Solicitor to the Association (Mr. Tweedy Smith) and Mr. Alderman Fleetwood Pritchard, who has professional connection, as a barrister, with the Metropolitan Borough Councils. From the published correspondence, it appears that the Association and Mr. Pritchard were both agreed that a fair compromise would be the adoption of the Ealing form of clause which prevents a local authority expending money upon electric wiring and fittings in the houses of consumers excepting through electrical contractors. But the County Council, probably still irritated by their defeat of 1903, would have nothing to do with the proffered compromise; and the clauses stand as the Bill was originally introduced. This looks—considering Mr. Pritchard's professional attachment to the Borough Councils—as though the County Council will not brook any interference with any of their projects for the supposed advancement of the interests of the less influential authorities who have relationship with them.

The character of the compromise which the Association sought to effect shows how strongly self-interest asserts itself in this particular sphere of their operations, and how ready they were to immolate one of their boasted principles to Mammon. One of the purposes of their very existence is to assist in confining municipal bodies to their legitimate zone of public work—to prevent the money of the ratepayers being expended in competitive businesses. But, considering this, it strikes one that the attitude of the Association is rather anomalous and inexplicable. On principle they object to municipal trading, and to the ratepayers' money being spent in competitive business; yet, when the same ratepayers' money is going to be expended through the members of the Association who are contractors for electrical goods, that puts another aspect on the matter, or appeals to them in a different manner. No doubt the electrical contractors would rather (for their own profitable ends) have dealings with a local authority who are moved in this matter by feverish speculation than with private customers; but it is not consistent to again pick up the threads of opposition to municipal trading at the point where personal enrichment drops, and only the single interest of the ratepayer comes in. For our own part, we object to any business being undertaken by municipal bodies in which there is the element of speculation, or which can be equally well carried out by private enterprise. In view of this, it would, in our opinion, invite greater respect for the Electrical Contractors' Association if they adopted a definite policy in this regard, and did not distinguish, in connection with their opposition, between speculation of the ratepayers' money direct and speculation through the electrical contractors. There is only one standpoint that is unassailable from which to view this question of municipal trading, and that is from the standpoint of the ratepayer. Even gas companies frequently arouse themselves and enter into the fray against electric lighting speculation; but they would have no valid ground for objection from the point of view of competitors, but only as ratepayers. As large contributors to the public funds, they object to the money for which they are partly responsible being used in venturesome manner, and in fostering competition against themselves as ratepayers, as well as in having to provide money to make good any loss on the competing undertaking. If the councils could show that the business was a certainty in point of financial success, the gas companies would not have another word to say. But it is seen the electrical contractors take a much narrower view of the question. In regard to the particular matter of free wiring, we hope the Association will be successful in securing the overthrow of the clauses; but if the Duke of Northumberland clauses are applied to all electric lighting undertakings who have the wiring and fittings clauses conferred upon them, we should not have much care in the matter.

The appearances are that the bubble blown over the combination of dust-destructors and electricity works has just about

reached bursting-point, through electricians, with but few exceptions, now being able to fairly estimate the combination at its true value. The matter has been lately before the electrical world with great prominence and frequency, owing to the reading of a paper of considerable length before the Institution of Electrical Engineers. The paper has been conveniently doled out to the readers of electrical literature during the past few weeks; and the adjournment of the discussion (now completed) has assisted in keeping its contents green for a longer time than is usual with such a production. The author's case is intended to be extremely favourable to the combination; and it is so much so that one naturally looks upon it with an amount of distrust. After reading the paper, most men will come to the conclusion that the combination of factors that are needed to make a success of the linking-up of a destructor with an electricity works is so large that very fine discrimination will be necessary before resolving that it is at all justified. As a matter of fact, all the advantage of this conjunction of the work of the sanitary department and that of the electricity department seems to be on the side of the former. Much point has been made, both in the paper and in its discussion, of the variable character of the refuse in different districts, and of the fact that the richest is most frequently found in coal-mining areas and in those inhabited by the poor. This is not new; but it is advanced as a matter to be favourably considered in determining upon a destructor. We are afraid that that is a frail reed upon which to place one's trust in such an important matter, seeing how little dependence can, as a rule, be placed in any district upon anything like uniformity of quality in the refuse of dwelling-houses. Then there is the objection arising from location. The best place for a central electricity station seems to be as the name implies a central position in a supply area; but that is not what one would regard as the ideal situation for a dust-destructor. The dust nuisance is another point. The figures in Mr. Adams's paper have been very seriously criticized, and are not likely to be accepted, excepting by those who do not want to discourage Mr. Adams, and those who are pleased to obtain a little encouragement for themselves. Sufficient reference to make the statistical statements clear would occupy too much space in these columns; and therefore they must be passed. But what the critics think of those statements is very well shown by two or three sample comments: "Mr. Adams claims more than the most sanguine estimate ever previously advanced by the most ardent partisan;" "exception must be taken to the exaggerated claims which are made as to the steam-raising efficiency of various destructors;" "the author claims very good results from refuse, and very bad ones from coal;" and his "claim amounts to saying that the heat-value of refuse is more than one-third that of the same weight of coal." The electricians are not quite so dubious as they formerly were on this destructor question; they are, in fact, arriving at closer agreement as to the combination not being an entirely satisfactory one for an electricity undertaking to enter into.

In dealing with general matters which do not affect the political note of his paper, it is a common thing for the ordinary journalist to regard it as a safe rule to follow, to laud the new and to damn the old. But in governing his writings in this manner, ignorance of what he is writing about frequently asserts itself. A case in point is furnished by the "Pall Mall Gazette's" Rome Correspondent, who commences a recent communication to our contemporary in this wise: "After getting used to the lighting of the catacombs with electricity, it need cause no shock to hear that its introduction into the Doge's Palace, Venice, is contemplated. From many points of view, it is a most necessary and wise departure; from others, much to be deplored. To be sure, fires in Italy seldom take place; but with petroleum, or even gas, there is the ever-present danger, which would be entirely obviated by electric light." It is, of course, to this correspondent, the correct thing to uphold the electric light, and to find some fault with the old servant, without troubling to know the truth. The fact that the Doge's Palace is in existence to-day shows that the "ever-present danger" has assisted in averting catastrophe; so that one finds it difficult to see where, from the danger point of view, the necessity for the change comes in. But we learn that, in the judgment of this sapient newspaper correspondent, the ever-present danger will be "entirely obviated by electric light." It was rather hard on our friend in Rome that about the same time his foolish communication was published, the London newspapers should have to record a serious fire, which threatened graver consequences than the mere loss of several hundred pounds' worth of property, at the Bucks County Asylum at Stone, where there are over 500 patients besides 100 attendants and others. "The cause of the outbreak," says the report, "was the fusing of a wire on a short circuit in the electric light installation." This comes as a severe comment upon the carelessly written assertion that the electric light will "entirely obviate" fire; and we have only to run through the back volumes of the "JOURNAL," to find similar illustrations, of which the Chicago theatre fire was one of the most terrible. This Rome correspondent is of those whose knowledge and belief is that there must be flame to constitute danger from fire. We prefer the "ever-present danger," to the insidious, concealed danger which experience has incontrovertibly proved accompanies the electric light. A leakage of gas makes itself unpleasantly noticeable; and where there is gas, fire cannot take place without a flame is applied. A gas-flame used for lighting, cooking, or heating is under constant observation, and there must be contact with something combustible to start a fire. The points of danger are "ever-present;" and in that there is a great protection. On the contrary, with the electric light, the uncomfortable thing is that one never knows what may happen, nor where. Fires break out in the most unlooked-for places, and frequently in positions that are not readily accessible. We should advise our contemporary to send to their Rome correspondent the report of the Bucks County Asylum fire. It may open his eyes to the delusion under which he is labouring, and will probably make him a little more suspect of the electric light.

THE INTERNATIONAL EXHIBITION AT LIÉGE.

IT may be remembered that in the "JOURNAL" for the 20th of September last we mentioned that arrangements had been made for holding an International Exhibition at Liége this year. We are now in a position to give further particulars in regard to the project, from circulars which have been issued by Mr. Thomas Cope, 54, Great Tower Street, E.C., the Commissioner-General for the British Section. The exhibition, which will be opened at the end of April, is organized under the direct patronage of His Majesty the King of the Belgians; it has the active co-operation of the Belgian Government, and is supported by the province and the city of Liége. The site selected is one specially attractive and favourable for the purpose. A large area for the numerous buildings and spacious grounds has been reserved in the valley of the Meuse, at its junction with the Ourthe, including the very beautiful "Parc de Cointe" of Liége. The general features of the exhibition will be those which usually characterize all international undertakings of this nature. There will also be special attractions for visitors, and a Colonial section of great interest and importance. France, Germany, and other nations in Europe, as well as the United States, have already notified their intention to participate, and large areas in the various buildings have been reserved for their exhibits. The contents of the buildings will be classified in 21 groups, comprising all branches of industry, arts, and sciences. These groups will be subdivided into classes. International Juries will be appointed to judge exhibits, and diplomas will be awarded, consisting of Grand Prizes, Diplomas of Honour, and Diplomas of Gold, Silver, and Bronze Medals. A large portion of the exhibition is to be devoted to mechanical appliances, and it is intended to show machines in actual work. A feature to which much attention will be paid, and from which important results are expected, is a series of congresses and conferences, which will be held at intervals in the six months during which the exhibition will remain open. It was mentioned, in our previous notice of the exhibition, that Class 75 (Group XII.) will include lighting appliances other than those in which electricity is employed. France has accepted the invitation to take part in the exhibition; and a Committee has been formed, with M. Cornuault as President, M. Mallet as Vice-President, and M. Fourchotte as Secretary, to take the necessary steps for ensuring a good representative exhibit of appliances connected with the gas industry. It may be taken for granted that the Belgian Association of Gas Managers will see that this is done so far as their country is concerned. It is therefore in the highest degree desirable that England should be adequately represented, in order that those of our neighbours who were unable to visit Earl's Court may see what we can do. A cordial invitation, it may be remembered, was extended to English gas technicians by M. Brandt, on the occasion of the gathering of Continental Gas Engineers in London last month; and it is to be hoped that it may not be allowed to pass unheeded.

The Late Mr. J. F. Bromley.—As briefly recorded in the "JOURNAL" last week, the funeral of Mr. J. F. Bromley, the distressing circumstances of whose death were the subject of an inquiry reported elsewhere, took place on Monday last week, at Batley Cemetery, where, despite the bitterly cold weather, there was a large gathering of friends and sympathizers. The ceremony was performed by the Vicar (Canon Davies). The Mayor (Alderman Hirst) was unable to be present, owing to indisposition; but he was represented by the Town Clerk (Mr. J. H. Craik). The majority of the members of the Town Council and the Corporation officials were in attendance, in addition to representatives of public bodies, and the Scarborough and Nelson of the Nile Freemason Lodges. Besides the family of the deceased, several carriages of friends followed. The following gas managers were present: Messrs. H. Townsend, Wakefield (President of the Manchester District Institution); J. H. Brearley, Longwood (the Vice-President); C. A. Craven, Dewsbury; John Laycock, Keighley; J. Sutcliffe, Brighouse; F. H. Pickles, Kildwick; J. Woodward, Skipton; J. W. Turner, Mirfield; W. J. Hartley, Gomersal; T. D. Overing, Birstall; G. Tooley, Leeds; A. E. Mottram, Ossett; and G. Niven, Cleckheaton. Mr. Wilson, of Leeds, and Mr. F. H. Lamb, of Manchester, were also present; but we understand that Mr. H. Kendrick, of Stretford, the Hon. Secretary of the Institution, was unable to attend on account of ill-health. The respect in which Mr. Bromley was held in Batley was testified by the raising of the flag at the Town Hall to half-mast, and the tolling of the bell.

NOTES ON THE THERMAL EFFICIENCY OF MODERN MOTIVE-POWER ENGINES.

Such is the title of an article by Mr. B. H. Thwaite, which appears in the current number of the "Vulcan"—a monthly newspaper published in Manchester. In it the author expresses his dissent from the views which have been recently expressed and discussed as to the practicability of constructing a really efficient and economical gas-turbine, and proposes, as an alternative, a combination of the steam-turbine and the reciprocating gas-engine. He appears to have been led to this by the difficulty as to compression when applied to the gas-turbine. This is no doubt a real one, although possibly over-rated by the adherents to the reciprocating type of engine. As Mr. Thwaite points out in the article, compression in the ordinary Otto cycle is effected within the power-developing cylinder, and, consequently, with a minimum of loss; whereas with the gas-turbine it must be effected as a separate operation, and would be inevitably attended with considerable loss, resulting from the flow of the compressed fluid through contracted areas, such as the ports and other connections of the compression cylinder. He foresees, moreover, that the ideal power gas of the future will be one in which carbon monoxide is the supreme agent of heat production, and in the use of which a high degree of compression is necessary to secure a sufficiently sensitive ignition. If, he says, a turbine gas-engine is to be economic, its fuel agent must be a gas that will be ignitably sensitive with comparatively low degrees of pre-compression, such as is oil vapour, or a gas rich in hydrocarbons. This condition, however, brings with it the difficulty of a higher range of temperature in the working cylinder, and the danger of overheating of the actuating organs of the engine. These considerations lead him to conclude that the most practical solution of the problem how to obtain the highest degree of efficiency from the fuel employed, is to work the two power-producing agents—the gas-engine and the steam-turbine—in harness together.

The great progress which has been made during recent years in the construction of internal-combustion reciprocating engines of high power encourages Mr. Thwaite to believe in the practicability of such a combination, in which would be utilized for steam production not only the sensible heat, which at the present time is lost in the necessary cooling of the gas to the temperature of the atmosphere, but also the heat absorbed by the water employed to keep cool the working cylinders and some of the actuating organs of the gas-engine, and likewise the exhaust gases of the latter. The steam thus generated would be available for driving a steam-turbine; so that the two types of power generating machines would be acting in interdependent connection for a common service. Thus the absolutely perfect combustion of the gaseous fuel in the working cylinder of the gas-engine would provide a great part of the thermal potential required for driving the steam-turbine. The gasification process and the gas-engine exhaust stages would be drawn upon to secure part of the balance of heat; the remaining thermal requirement being satisfied by direct combustion of the gaseous fuel in the steam-boiler furnace. The steam-turbine and its steam-generating accessories would serve for starting the gas-engine, and provide also the reversal motion requirements. The operation of such a combination is thus described: "The rapid starting of the gasification process with fan propeller, driven with steam initially generated with solid fuel to be subsequently displaced with gas, the starting of the high-power vertical gas-engines with the steam-turbine; the reversal of the gas-engines by the steam-turbine, which will, of course, be compounded and equipped with condensers; the proportion of the gasification product required to be used in the steam-generator will be small because of the thermal assistance given by the gas-engine, hot jacket water, &c."

It is claimed that the application of this combination to ocean steamships might result in a total thermal saving of 55 per cent. on the best existing marine engine practice, besides a lessened consumption of water; while the tell-tale trail, to say nothing of the discomfort to passengers of smoke issuing from the funnels of steamships, would practically disappear. For battleships, it possesses additional features of strategic value. During an engagement, for example, the steam-generating plant could be shut down altogether, and there would be no danger of self-destruction should the steam-boilers be pierced with shot or shell; while the piercing of the funnels (of small proportion compared to those of existing practice) would not interfere with the efficiency of the gas-engines. The fuel would be fed into the high-pressure gas-generators automatically; so that the stokers' work in the boiler stoke hole of a battleship would be deprived of its terrors, and, owing to the reduction in the weight of fuel required for a given power, the storage space would represent more extended running power. A like proposition for inland service would assist in the prevention of smoke, and enable recovery to be made from bituminous fuel of the condensable hydrocarbons and ammonia; the programme of operations involving only temporary use of solid fuel.

It will be seen that the scheme is a complicated one, and can evidently be applied only on a large scale. Indeed, the article commences with a statement which prepares the reader for this, by saying that "the economic supremacy of the principle of centralization in modern work of power-energy-development, and the distribution and transmission of such power electrically, is now proved beyond cavil." Without desiring to "cavil" at this or any other statement by the author, our impression is, that the economy of distribution and transmission of power electrically over large areas has by no means been proved, but rather that the cost of such transmission, having regard to capital outlay involved, exceeds any saving that has hitherto been effected by concentration. This, however, cannot be urged as a reason against any such scheme as that which is proposed by Mr. Thwaite; on the contrary, it should be an encouragement to persevere in the production of means by which to effect the great fuel economy which appears to be in sight.

THE LIABILITY OF SHAREHOLDERS IN ENGLISH COMPANIES TRADING ABROAD.

A case of considerable importance to shareholders in English Companies trading abroad was decided in the King's Bench Division of the High Court of Justice by Mr. Justice Kennedy last Wednesday week. It was an action brought by the Risdon Iron and Locomotive Works, carrying on business at California, against Sir Christopher Furness, as a member and shareholder of and in the "Copper King, Limited," an English Company trading in California, claiming the sum of £456, being the proportion of the debts and liabilities of the Company for which the defendant was alleged to be liable to the plaintiffs in respect of machinery and goods supplied by them to the Company.

The statement of claim was that plaintiffs are a Corporation incorporated under the laws of the State of California, and the defendant is a member and shareholder of and in a Company having registered offices in the City of London, and was the holder of certain shares in the said Company, which was registered as a Joint-Stock Company under the Companies Acts, 1862-1898, with a capital all of which was fully subscribed. The objects for which the Company was incorporated related principally to mining; and the plaintiffs supplied them under contract with machinery and goods, and did certain work and labour for them. Failing to obtain payment for the goods, plaintiffs issued writs of attachment, which resulted in a petition of bankruptcy being filed against the Company. They were subsequently adjudicated bankrupt according to and under the bankruptcy laws of the United States. The plaintiffs then became creditors of the bankrupt estate; while the shareholders of the Company decided that they should be voluntarily wound up. It appears that, by the constitution of the State of California, it is provided that each stockholder of a corporation or joint-stock association shall be individually and personally liable for such proportion of all its debts and liabilities contracted or incurred during the time he was a stockholder as the amount of stock or shares owned by him bears to the whole of the subscribed capital stock or shares of the corporation; and also that no corporation organized outside the limits of the State shall be allowed to transact business within the State on more favourable conditions than are prescribed by law to similar corporations organized under the laws of the State. Each stockholder of a corporation within the State is thus personally and individually liable for such proportion of its debts and liabilities as the amount of stock or shares owned by him bears to the whole of the subscribed capital stock or shares of the corporation, and for a like proportion only of each debt or claim against the corporation. It is further provided that any creditor of the corporation may institute joint or several actions against any of its stockholders for the proportion of his claim payable by each. There are further provisions of an equally stringent nature dealing with the cases of stock held by minors, and under trust—all tending to make clear the fact that in the State of California there does not exist any such thing as "limited liability" as understood in this country. It was accordingly claimed that the defendant, as a member and shareholder of and in the Company referred to, carrying on business in California, thereby became subject to the laws of the State, and personally liable for his proportion of the debts incurred by the Company.

Mr. Justice Kennedy, in giving judgment, decided that the plaintiffs' statement of claim disclosed no cause of action, inasmuch as the Company in question is an English Company, registered under English law, the liability of whose members is, as the Memorandum of Association expressly states, limited—that is to say, limited under and according to the provisions of the English law which governs such companies, and prescribes and defines the liabilities of their shareholders. The Company might, under their articles, take all necessary and proper steps to comply, on the part of the Company, with the requirements of the law of a foreign country where the company carries on business; but any proceeding on the part of the Company to enlarge the boundary of the liability of a shareholder beyond the boundary fixed by the constitution of the Company, cannot be upheld in an English Court, which cannot recognize a claim in respect of debts of the Company, arising by virtue of these laws, which is inconsistent with the limitation of the shareholder's liability according to English law. Judgment was therefore given for the defendant.

NEILSON ON WIND PRESSURE.

THE subject of wind pressure is one of permanent interest for engineers, and therefore it is fit matter for periodical discussion. Some time has now elapsed since the subject was brought before the attention of readers of the "JOURNAL;" the latest recorded addition to the gas engineering literature of the question being due to Mr. Irminger, of Copenhagen.

The "Engineering Magazine" last year contained a thoughtful essay on the subject of the effect of wind pressure on structures, by Mr. Robert M. Neilson, who has succeeded in making a consistent story of most of the scattered data and observations relating to the matter to be found in professional papers and reports, and has brought out from these some important deductions which are worth reproducing. It is unnecessary to follow Mr. Neilson through the history of the rise of the element of wind pressure to importance as a point for consideration in calculations of the stability of engineering structures, which he traces to the Tay Bridge disaster of 1879. He is not quite justified in thinking that, prior to this occurrence, engineers did not generally estimate or provide for wind pressures—at any rate on iron roofs. One important result of the disaster referred to, however, was that the Board of Trade somewhat precipitately accepted the figure of 56 lbs. per square foot of exposed surface as the maximum wind pressure to be provided against; the fact being that, although still higher pressures had been experimentally indicated by the instruments then and previously used for the purpose, the occurrence of no such pressure over a large area has ever been proved.

Sir J. Wolfe Barry is prominent among the engineers who have never believed in the occurrence of such high wind pressures; and he has protested against the waste of money involved in making unnecessary provision against wind strains of 56 lbs. per square foot. He declares he knows what this meant in the case of the Tower Bridge, where over the area of the bascules nothing more than a few pounds of wind pressure was ever registered. In the case of the Forth Bridge, the pressure allowed for wind almost equals the dead and the live loads put together; and, of course, it considerably increases the former. The discovery of the existence of a discrepancy between the amount of wind pressure on large and small surfaces was made again by Sir Benjamin Baker, at the Forth Bridge, after it had been noticed by several observers in the Eighteenth Century. It is of the first order of practical importance, because it helps to account for the stability of the largest structures, including ships. The immense new steamships of the present day could not keep the sea if they felt the wind proportionately as small vessels do; and the large gasholders of the period are similarly much safer than the small ones. The chief reasons for this difference are, first, that the average velocity of wind is very much exceeded by that of small local currents in the same wind. One such current, striking an anemometer, will impress its velocity upon it, while really making little difference to the pressure over an extensive area. The other reason is that large bodies very much interfere with the direct action of the wind by the lateral currents flowing off from the surface, which probably "pond back" the wind very considerably.

One gets a promising means of measuring the actual horizontal force exerted by wind in cases where railway waggons have been upset. There is good reason to believe that reliable data in this regard are furnished by the observations of Seyrig on incidents of the kind in the experience of the Southern Railway of France. In certain mountainous parts, trucks have been blown over, which would require a pressure of from 26 to 34 lbs. per square foot of surface to do it; while heavier vehicles in the same train have escaped. It may, therefore, be considered as highly probable that these trucks were exposed to an overturning pressure of wind of the amount stated; but this is all that can be reasonably concluded. It does not follow that a much larger object than a railway truck would have been subjected to the same pressure all over it. The difficulty of fixing a proper allowance for wind pressure, say, for Great Britain, remains; and all that seems trustworthy is that the larger the structure, the less the allowance per square foot that need be made. Thus we get the rather anomalous result that a small iron shed may be unroofed by the same gale that will not hurt a big gasholder standing beside it.

Mr. Neilson gives and discusses the various formulæ that have been proposed and met with more or less acceptance for converting wind velocity into pressure. The noteworthy feature of these formulæ is their disagreement, which in the extreme cases amounts to 100 per cent. "As, however," says the writer, "the pressure on a large area has been shown to be different from that on a small area for the same wind velocity, these formulæ are obviously of little use for general application." So much for a huge mass of clever work in a very difficult field for experiment. It is worthy of remark, however, that the freshest formulæ give the lowest results. If one must be chosen, Dines' is perhaps the best. It is $p = V^2 \times 0{\cdot}003$: where p denotes the pressure in pounds per square foot, and V is the velocity in feet per second. But one of the main considerations in regard to the effects of wind pressure is the distribution and operation of the force. How does wind act upon a structure? The answer indicates a fresh crop of uncertainties and difficulties. Wind is a highly elastic, frictionable body in rapid motion; and, from its nature, all sorts of effects follow. If a surface is exposed to wind at an angle, the pressure will be greater at the front edge than at the rear edge. A throttle-valve in a steam-pipe tends to close against the flow of steam.

This leads Mr. Neilson to mention the experiments of Irminger and Vogt. He notes as fairly well established that the pressure of wind on an inclined roof is greater near the eaves than near the ridge, and that at the latter point there may even be a negative pressure—tending to lift the slates off. He might go further, and lay stress upon the necessity for holding down roof coverings. "Experiments and observations have shown that there may be, and probably always is, a negative pressure or upward suction over the top of a gasholder during a heavy wind." Irminger is quoted in support of this statement. But again, the phenomenon of the back-suction is repeated at the rear of a cylindrical body, as a gasholder. The positive pressure of wind extends only over less than half of its diameter; most of the rest being subjected to negative pressure, or suction. The actual amount is not known.

Mr. Neilson proceeds to discuss the comparative action of wind pressure upon square and round chimneys. He makes several interesting calculations which he candidly admits are of no practical value, because they rest upon unverifiable assumptions in regard to the manner of the wind's action. It would be a good thing if an equal degree of modesty were shared by authors of engineering text-books in general. What he does say about his calculations is perfectly sensible: If the assumptions are just, then the computed results must follow—which is precisely where the weakness of most engineering mathematics occurs!

Quickly abandoning calculation, therefore, Mr. Neilson goes on to recount the results of the experiments of various investigators with falling plates, hemispheres, &c., with the object of ascertaining the value of the exhaust action on the leeward side. Some of these seem to show that the exhaust is equal to one-half the pressure on the windward side; but the fact is doubtful. Very interesting are Baker's experiments with double plates—one at a variable distance behind the other. The structure represented is a plate girder bridge; and it is found that the two sides are mutually protective.

On the subject of inertia as an element of the stability of structures exposed to the wind, Mr. Neilson is sound, but indefinite. He suggests that a series of comparative tests with gauges which require different amounts of work to make them record would be very interesting and instructive. His own contribution to the available stock of knowledge of the conditions of stability is summed up in the statement that "a large structure is more stable than a small one of a similar shape and nature." That is to say, it takes a greater wind pressure per square foot to over-turn a large structure than to overturn a smaller one of the same shape and quality of stability. This theorem he demonstrates conclusively with regard to similar columns, whose stability is shown to be equal to their bases, as in the accompanying diagram. The rule is to be taken as approximate only, as there are several considerations which are left out of account—such as skin friction of the wind, the effect of the friction of the ground on the wind at the front and sides, and the varying intensity of the wind on structures of different sizes. "The rule, however, is, roughly speaking, correct; and it explains why in Nature an insect has such a large leg base and a large quadruped proportionately such a small one."

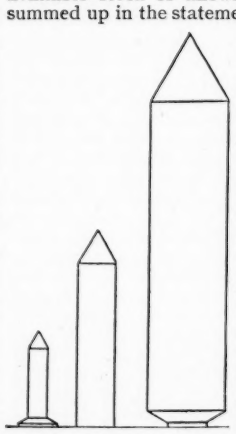


DIAGRAM ILLUSTRATING THE EFFECT OF SIZE ON STABILITY.

[The bases—relatively very different—give equal stability against wind pressure.]

Mr. Neilson concludes his paper with a few words on the effects of tornadoes, which do not trouble us in Great Britain, but are occasionally very destructive in the United States. It being practically impossible to make adequate provision against such abnormal atmospheric vicissitudes, the more prudent course is to ignore them and take the chance (which is really very small) of one of them striking a structure. In this event, the damage is mostly done by a sudden drop of atmospheric pressure, which may amount to $1\frac{1}{2}$ inches of mercury within so short a time as to amount to instantaneous action. Seeing that every inch of mercury corresponds to a pressure of 70·7 lbs. per square foot, such a fall would mean that the walls of every building and the sides of every gasholder would be subjected to a bursting pressure of 106 lbs. per square foot. The consequences need not be described; but the hypothesis was thoroughly substantiated by what was observed at St. Louis in 1896. In the great gale of the last days of February, a passenger train was blown over on the Leven Viaduct near Ulverston. The Harbour-Master at Barrow stated that his anemometer on this occasion registered, over a considerable period, a wind velocity of 100 miles an hour, which is equivalent to a force of 49·2 lbs. per square foot.

The Gas Committee of the Coventry City Council have decided to recommend that the salary of Mr. Fletcher W. Stevenson, their Engineer, be increased by £100 a year.

WATER BILLS FOR 1905.

(*Concluded from page* 158.)

THE Llandrindod Wells Urban District Council seek authority for the construction of new works, consisting of an intake, with filter and settling-tank, in the parish of Llanafan Fawr, in the county of Brecknock, and a conduit or pipe-line commencing thereat, and terminating in the existing mains. It is proposed to take all waters that can be intercepted by these and the other works of the Council, including the Rivers Ithon and Chwefri and the tributaries of the former; and to complete the new works within eight years. Power is sought to borrow £10,000 for the purpose, to be repaid within sixty years from the date of obtaining the loan.

The Loughborough Corporation require an extension by four years, from June 3, 1905, of the time granted for the completion of the water-works authorized by their Act of 1897, and of the period for the repayment of borrowed money till June 3, 1909, or such other time as may be specified. Power is sought to purchase certain lands adjacent to the existing reservoir and filter-beds in the parish of Nanpantan, in the rural district of Loughborough. Sanction is required to the raising of such money, not exceeding £80,000, as may be required for the purposes of the Act, to be repaid within sixty years; and a sinking fund is to be formed within twelve months from the date of borrowing.

In an Improvement Bill promoted by the Mansfield Corporation, power is sought to construct additional water-works, comprising a well and pumping-station in the parish of Clipstone, and a conduit or pipe-line connecting them with the existing mains in the borough. A period of seven years is proposed for the completion of the works. An extension of the limits of supply to Clipstone is applied for, as well as permission to raise £40,000 in respect of the works specified and of the water undertaking generally, to be repaid within sixty years. An agreement has been entered into with the Duke of Portland for the purchase of the land for the proposed works, and its confirmation is one of the objects of the Bill. Another is to enable the Corporation to sell the works and plant employed for the supply of water in the added area.

The Bill of the Morley Corporation includes provisions for the construction of two conduits or pipe-lines—one commencing at Brighouse and terminating at the Bruntcliffe service reservoir, and the other starting from this conduit and terminating at the Victoria service reservoir—to be completed within five years. Authority is sought for entering into agreements with the Halifax Corporation for the supply by the latter of water in bulk, and with local authorities or others for a similar supply by the promoters. A sum of £20,000 will be required for the works specified; and it is proposed to ask for sixty years for its repayment.

The provisions of the General Bill promoted by the Nottingham Corporation relating to water supply include power to construct a covered service reservoir, to be called the Ramsdale Hill reservoir, in the parish of Arnold, and a deviation of part of one of the aqueducts authorized by the Corporation's Water Act of 1897, commencing at the new reservoir and terminating at the aqueduct specified. The Corporation ask for the repeal of the powers conferred by the above-named Act to construct the Cockpit Hill reservoir and so much of the aqueduct as is rendered unnecessary by the new works proposed, which are to be completed in five years from the passing of the Bill. Permission is sought to apply to the above-named purpose any money already raised or that may be hereafter borrowed under the Act of 1897.

The powers sought by the Rhondda Urban District Council in respect of their water undertaking relate mainly to extensions of the time specified in certain Acts for the purchase of land and the completion of works. In the case of the land, three years from the passing of the Bill are required; and in that of the works, five years from July 2, 1906, and seven years from July 31, 1905, are proposed. Authority is asked to substitute a fresh set of water rates and charges for those named in the Act of 1896.

The Skegness Bill is to incorporate a Company to take over the private water-works of the Earl of Scarborough, and supply water within the urban district of Skegness, the parish of Winthorpe, and part of the parish of Croft, in Lincolnshire. The capital of the Company is to be £37,500, in £5 shares, with borrowing powers to the extent of one-third. Power to create debenture stock will be sought. The price to be paid for the works is to be determined, failing agreement, by an arbitrator appointed by the President of the Institution of Civil Engineers. It is proposed to construct a pumping-station and a covered service reservoir in the parish of Welton-in-the-Marsh, and two conduits or pipe-lines connecting them with the existing water-tank at Winthorpe—to be completed within five years, from the passing of the Bill. The Company wish to be empowered to purchase, lease, or erect dwellings for their workpeople. It is intended to afford a constant supply of water, at specified charges, based on the gross estimated rental of the premises, but in no case for less than 8s. 8d. per annum or for a shorter period than twelve months. The other provisions are the usual ones relating to the sale of water by measure (at a price not exceeding 2s. per 1000 gallons), the supply of meters, fittings, and materials, and giving authority to make bye-laws for preventing waste.

By the South Oxfordshire Water and Gas Bill, it is proposed to dissolve and reincorporate the Thames Valley and Goring Water and Gas Company, Limited, with limits of water supply extended to a number of parishes in Oxfordshire, as well as to portions of others which are not included within the limits of the Henley-on-Thames Water Company, Limited. The water capital of the Company is to be £175,000, which is to consist of the amounts of £8000, £8720, and £8225 previously sanctioned, and additional capital of £150,055, which it is proposed to raise either as ordinary or preference, in £10 shares, or as stock; and it is to be issued by auction or tender. The dividend on the original water capital is to be limited to 10 per cent., and on the additional to 7 and 6 per cent. Borrowing powers to the extent of one-third of the capital are sought, as well as authority to acquire the water undertakings of any person, company, council, or body now supplying water within the limits defined. The water is to be supplied at such pressure as can be produced by gravitation. The charges for domestic supplies are 8s. 8d. per annum where the rateable value of the premises does not exceed £5, and from 8 down to 6 per cent. for higher values. Special rates are proposed for supplies at a greater height than 20 feet below the sill of the reservoir at Cleve. The Company ask to be allowed to sell water by meter for other than domestic purposes, provided it does not interfere with the regular service; and they will supply it to road and sewer authorities, when required, at a rate not exceeding 2s. 6d. per 1000 gallons. The Bill includes power to make and publish regulations, and to repair or alter pipes, &c., where they do not conform to them; also to sell or let meters and keep them in repair. The water undertaking accounts are to be kept separate from those relating to the supply of gas.

The Bill promoted by the Southport, Birkdale, and West Lancashire Water Board is to authorize them to construct new works, and extend their limits of supply so as to include the township and parish of Bickerstaffe, in the rural district of West Lancashire. The works consist of a reservoir and pumping-station at Bickerstaffe, three conduits or pipe-lines, and a covered service reservoir and water-tower in the parish of Aughton. Seven years are asked for the completion of the first group of works, and ten years for those at Aughton. The pipes belonging to the Earl of Derby in Bickerstaffe are to be acquired. The Board also seek authority to enter into contracts for the purchase of water in bulk, to accept rates for a portion of a quarter, and to allow discounts to owners of groups of houses paying rates in advance. Power is required to borrow £106,400 for land and works, £60,000 for mains, &c., £4000 for additions to the Springfield pumping-station, and the amount necessary for purchasing the plant of the Earl of Derby and paying the costs of the Act. Permission will be sought to raise money, during a financial year, to meet current expenses; and an extension of ten years is asked for the repayment of money borrowed under the Board's Act of 1901. Provision is made for altering the constitution of the Board.

The Stockport Corporation will ask Parliament to sanction the appropriation, for the purposes of their water undertaking, of the waters of the River Kinder, before the completion of the reservoir on the river authorized by their Act of 1901. The quantity to be drawn is not to exceed 5 million gallons a day; and it will only be taken when 100 million gallons or more are passing over the weir constructed by the Corporation across the river. Authority is sought for the construction of an intake on the right bank of the river, in the parish of Hayfield, a conduit or pipe-line from it to an existing conduit constructed under the powers granted by the above-named Act, and another commencing at the latter conduit and terminating at the Bollinhurst reservoir. Powers are sought to acquire lands compulsorily, to be exercised within five years after the passing of the Bill, and to borrow £6000, to be repaid within fifty years from the date of incurring the debt.

The Sunderland and South Shields Water Company's Bill is to empower them to construct additional works, consisting of four wells and pumping-stations—one in the parish of Butterwick and Oldacres, another in the parish of Sheraton-with-Hulam, and the other two at Castle Eden—service tanks at the two last-named places, and a number of adits and pipe-lines in connection therewith. A period of fifteen years is asked for the completion of the works; and also authority to raise additional capital to the amount of £600,000, carrying borrowing powers to the extent of one-fourth, to be exercised as provided in the Bill. The new capital is to be issued by auction or tender, and to be limited to a dividend of 5 per cent.; any shares or stock not sold to be offered to the shareholders. Debenture stock may be created. The Bill contains provisions for the protection of Mr. Rowland Burdon and the Wingate and District Water Company, Limited, as well as for authorizing the laying of pipes in undedicated roads, the acquisition of easements only for adits and pipe-lines, and for taking additional lands by agreement and selling surplus lands. It is proposed to extend the limits of supply to include the parishes named as well as Embleton, Elwick Hall, Hutton Henry, and Monk Hesleden, all in the county of Durham.

Additional powers in respect of their water undertaking are included in the General Bill of the Swansea Corporation. They wish to construct a service reservoir in the parish of Clase Rural, a tank for regulating the pressure, and four aqueducts or pipe-lines; and they will ask for a period of seven years in which to complete them. Permission will be sought for selling water in bulk beyond the limits of the Corporation, but not to the detriment of the supply within the limits. For the purchase of land

and the construction of the works specified in the Bill, the sum of £250,000 is required; but it is also to be used for the general purposes of the water undertaking, and the completion of the works authorized by the Act of 1892. For the repayment of this money, sixty years are required.

The Bill of the Tees Valley Water Board is to confer further borrowing and other powers upon them. They require an extension of the time limited by the Stockton and Middlesbrough Water-Works Act, 1890, and the Tees Valley Water-Works Act, 1899, for the completion of certain specified works—in the case of the former Act, to Dec. 31, 1914; and as regards the latter, to the corresponding date in 1906. They wish to be authorized to increase the reserve fund from the £30,000 mentioned in their Act of 1876 to £100,000; and to modify the enactments relating to the application of the revenue of the Board. It is proposed to empower the Corporation of Thornaby-on-Tees to mortgage the borough fund and district rate for the purpose of securing the repayment of any moneys they are now authorized to borrow, but have not yet borrowed, under any of the Water Acts. Permission to raise more money is required, in the following proportions: Stockton, £205,530; Middlesbrough, £246,636; and Thornaby, £41,106—all to be repaid within sixty years from the date of borrowing. The Bill contains provisions with respect to the mode of raising the money, the liquidation of the loans by means of a sinking fund, and the payment of interest until the completion of the works.

The Conservators of the Thames have promoted a Bill mainly for the purpose of obtaining further powers for deepening, widening, and improving the bed and channel of the river; but it contains two clauses (37 and 38) bearing upon water supply. The former sets forth that, notwithstanding anything contained in any other Act of Parliament, the point of measurement of the flow of the river for all supplies of water taken by the Metropolitan Water Board below Penton Hook shall, as soon as Molesey Weir is in a fit state for the purpose, be at the weir. The latter clause gives power to the Conservators on the one hand and the Water Board on the other to enter into agreements with respect to the taking of water from the river, and all matters arising out of or incidental thereto.

The Torpoint Water Bill is to authorize the Urban District Council to construct works and supply water within their district. The works consist of an intake weir or dam on the Withey Brook, a service reservoir in the parish of Millbrook, a series of filter-beds and settling-tanks in the parish of North Hill, three aqueducts, and an overflow and wash-out, with subsidiary works; the period for their completion being seven years from the passing of the Bill. The waters of the Withey Brook, streams, and springs are to be taken to the extent of 500,000 gallons per day. The water is to be supplied at such pressure as can be afforded by gravitation from the reservoir whence it is drawn; and it is to be charged for on the rateable value of the premises supplied. Clauses are inserted to sanction the sale of water by measure and in bulk, to sell or let meters, and to make bye-laws for the prevention of waste. Power is sought to borrow altogether £56,000 for carrying out the works contemplated; to be repaid, as to £50,000, within sixty years, and as to the rest within forty-five years. How the water revenue is to be applied is explained in the Bill, as is also the mode of paying off the money borrowed.

The Truro Water Bill is to authorize the Truro Water Company to construct additional works, acquire lands, and raise further capital. The works consist of a conduit or pipe-line and a covered service reservoir in the parish of St. Clement, and the lands adjoin the existing open conduit of the Company. The latter are to be purchased within three years, and the works completed within six years, after the passing of the Bill. The additional capital required is £20,000. It is to be limited to 7 per cent. dividend if issued as ordinary, and to 6 per cent. if as preference capital, and to carry borrowing powers to the extent of one-fourth. Authority is asked to create debenture stock. The general provisions of the Bill are of the usual character.

The Bill promoted by the Western Valleys (Monmouthshire) Water and Gas Company is to allow of a re-arrangement of the capital and borrowing powers. At present the accounts of the gas and water undertakings are kept distinct; but it is proposed to treat them as one. The existing capital is to be defined at £60,000; and after the passing of the Bill the Company ask to be empowered to raise and expend any balance of unissued capital not exceeding £60,000 by the issue of ordinary or preference shares or stock. The dividend on the former is to be limited to 10 per cent., and on the latter to 5 per cent. per annum. Power to borrow to the extent of £15,000 is applied for, and also to create debenture stock. The Bill has been more fully dealt with among the Gas Bills (see *ante*, p. 82).

Reports of Gas Associations, 1904.—It will be seen, by an announcement which appears elsewhere, that this volume is now ready. It contains the reports of the proceedings at the meetings of the various District Associations of Gas Managers last year; the papers read being illustrated by a plate and 37 diagrams, &c. These are preceded by an index, and followed by lists of the office-bearers and members of the Associations. This is the twenty-second year of publication of the book, which presents a large quantity of valuable technical matter in a shape which allows of easy reference being made to it.

PROPOSED LEGISLATION ON GAS TESTING, WITH SPECIAL REGARD TO ILLUMINATING POWER.

By H. Leicester Greville, F.I.C., F.C.S., &c.

The London Gas Companies must be at least credited with sufficient wisdom to know what is best for their own interests; but I must confess to being somewhat surprised at three Companies supplying different grades of gas combining in the advocacy of a uniform method of testing, and that one not, in my humble opinion, capable of affording the best results.

Let the question of the different grades of gas be placed categorically: The South Metropolitan, 14-candle coal gas. The Commercial, 14-candle mixed coal and carburetted water gas; the proportions of each being at their own discretion. The Gas-light and Coke Company, 16-candle gas; also consisting of any proportions of coal gas and carburetted water gas which may be considered necessary. Uniformity in testing is only advisable where the system employed would do justice to varying conditions. The proposal to burn up to a three-and-a-half inch flame would not meet the emergency to the highest degree—it would at most be a compromise. I think that I may fairly state, without fear of contradiction, that, taking the Sugg "London" argand as a convenient burner for testing purposes, the more the gas consumption is increased so as to fill the prescribed sized chimney with flame (short of smoking), the higher the light development. The increase in illuminating power is greatest in the lower-grade gases, and would therefore tend to the interests of gas companies. This is not a biased statement in favour of gas companies, but a record of experience and general knowledge of conditions of light development with a fixed burner, used with high and low grade gases, and of the necessity of modifying the methods of testing to adapt themselves to special circumstances.

The London Gas Companies have at the present time an exceptional—it might be said an unprecedented—opportunity of seeking to obtain redress from grievances from which they have previously suffered. Would it not be advisable in one of the principal points—viz., the methods of determinating illuminating power—that they should make the best claim for their own interests? If there is hereafter considered to be any claim of justice, a Parliamentary Committee, hearing both sides of the question, will be capable of forming a fair judgment. In place of advocating a three-and-a-half inch flame for testing purposes, why should not a four-and-a-half inch flame be proposed? This would be more equitable to different grades of gas, and would afford no injustice to any particular company. Possibly, on the opposition side, the London County Council would claim that the Gas Companies were trying to advocate a system of testing which would exaggerate the alleged quality of their gas. Considering that all prescriptions for defining illuminating power are simply arbitrary, and have no connection under modern circumstances with the maximum light to be got under economical conditions by the consumer, the question, if raised, could be easily met.

With regard to the proposition of the three-and-a-half inch flame, coupled with the employment of the Harcourt table photometer, there seems to be no particular objection to the retention of this particular form of instrument under the altered conditions. The abrogation of the system of burning up to a constant of sixteen candles and the proposed substitution of a three-and-a-half inch flame, of course, necessarily involves the burner having a sliding adjustment to bring the light into equality with that evolved from the standard 10-candle pentane. Whether it is better under these altered conditions to adhere to the table photometer—which was not originally devised for such an emergency—or to revert to an open bar with fixed lights and a moveable disc, is an open question. Personally, I should favour the latter form of arrangement.

Of other matters, the claims of the abrogation of sulphur limits may appear reasonable; but with regard to testing for sulphuretted hydrogen, it seems to me totally unnecessary to introduce a quantitative test as to not more than 1 grain per 100 cubic feet. Surely in such a simple matter, a definite exposure for a definite period of gas to lead paper would meet all the question. The ammonia question is apparently not disputed—viz., the limit of 4 grains per 100 cubic feet. Considering that it is to the interest of the gas companies to sell all the ammonia they can get from their gas in the commercially available form of sulphate of ammonia, comment on this point is obviously superfluous.

The abolition of the Gas Referees is advocated mainly by the South Metropolitan Gas Company. With a strict definition of legal methods of testing embodied in specific Acts of Parliament, it would be difficult to state any definite reason for the perpetuation of their existence. The chief of their original functions was to prescribe from time to time the maximum amount of impurity with which the gas should be chargeable and the methods of testing. All these details could be settled by parliamentary procedure; the only difficulty being that, should any unprecedented difficulty arise, instead of it being able to be dealt with promptly between the Gas Company and such a body as the Referees, the more cumbrous method, redolent of red tape, exorbitant expenses, and other details connected with the promulgation of a fresh Bill in Parliament, would have to be resorted to.

This possibility is not, however, likely to happen if a reasonable arrangement is made in the immediate future as at a re-adjustment of general conditions of testing between the Gas Companies on the one hand, and parliamentary sanction on the other.

With regard to another claim of the Gas Companies—viz., the abrogation of Sunday testing—I am entirely in sympathy. Why the County Council should disregard the old adage of the Sunday being legally a "*Dies Non*," should suspect the Gas Companies of committing a criminal offence on that particular and honoured day, and victimize their gas examiners to perform duty on what is usually regarded as being a day of rest, possibly remains in the records of their criminal investigation department in their private archives.

As to the possible relief which it is probable that changes in procedure may afford to the Companies, the abrogation of sulphur compounds, and the mitigation of the stringency of the method of testing for sulphuretted hydrogen will possibly be foremost. Penalties amounting to £50 per day might, under the old regulations, be incurred. The minor penalty of only £2 for a deficiency of half-a-candle in illuminating power, seems a small question; and yet it is a large one. I believe it is an adage with gas companies that money is made in the retort-house. This simply means that the maximum profits are derived from making gas. This is (with due management) regulated largely by the restrictions as to the necessary illuminating power of the public gas supply. The question of the methods defined for the determination of official illuminating power is therefore, in a sense, of the most importance. We are still, unfortunately, not in a position to define the exact conditions of testing. The London Companies are proposing a system which, while being an advance, does not go as far as it might. With regard to other gas companies, there is no agreement each between the other; so that the adoption of any universal system of testing seems as far from realization as ever.

From the notes in the "JOURNAL" as to different systems of testing advocated by various gas companies, I have compiled the following list:—

ANDOVER GAS COMPANY: 14-candle gas. Ten-candle Harcourt pentane lamp, and Sugg's "Wandsworth" 14-candle argand.

AYLESBURY GAS COMPANY: 14-candle gas. The testing burner (Sugg's (argand) so constructed as "to develop in its use the full illuminating power of the gas of the quality prescribed by the Act."

BRENTWOOD GAS COMPANY: 14-candle gas. Sugg's 16-candle argand No. 1 used at such a rate of consumption as will produce a light of 16 candles is mentioned as the testing burner, provided that, on the application of the Company, the Board of Trade may approve any other burner.

BROCKENHURST GAS COMPANY: 14-candle gas. Sugg's "London" No. 1 argand, with a 6 inch by 1¾ inch chimney; but if at any time, and so long as the gas-flame rises above the top of the glass, a 6 inch by 2 inch chimney shall be used, or any other burner or chimney approved for this purpose by the Board of Trade.

EAST COWES GAS COMPANY: 14-candle gas. Testing burner merely described as type known as Sugg's argand, constructed to develop in its use the full illuminating power of the quality prescribed.

EPPING GAS COMPANY: 14-candle gas. Sugg's argand burner for gas of such illuminating power, or any other burner or chimney approved by the Board of Trade.

GREAT BERKHAMSTED GAS COMPANY: 14-candle gas. Test burner, Sugg's "Wandsworth."

HESSLE GAS COMPANY: 14-candle gas. Sugg's No. 1 "London" argand.

HITCHIN GAS COMPANY: 15-candle gas. Sugg's No. 1 "London" argand.

NORTH SUSSEX GAS COMPANY: 14-candle gas. Sugg's No. 1 "London" argand.

OTLEY GAS COMPANY: 14-candle gas. Sugg's "London."

SEAHAM GAS AND LIGHTING COMPANY: 14-candle gas. Sugg's No. 1 "London" argand.

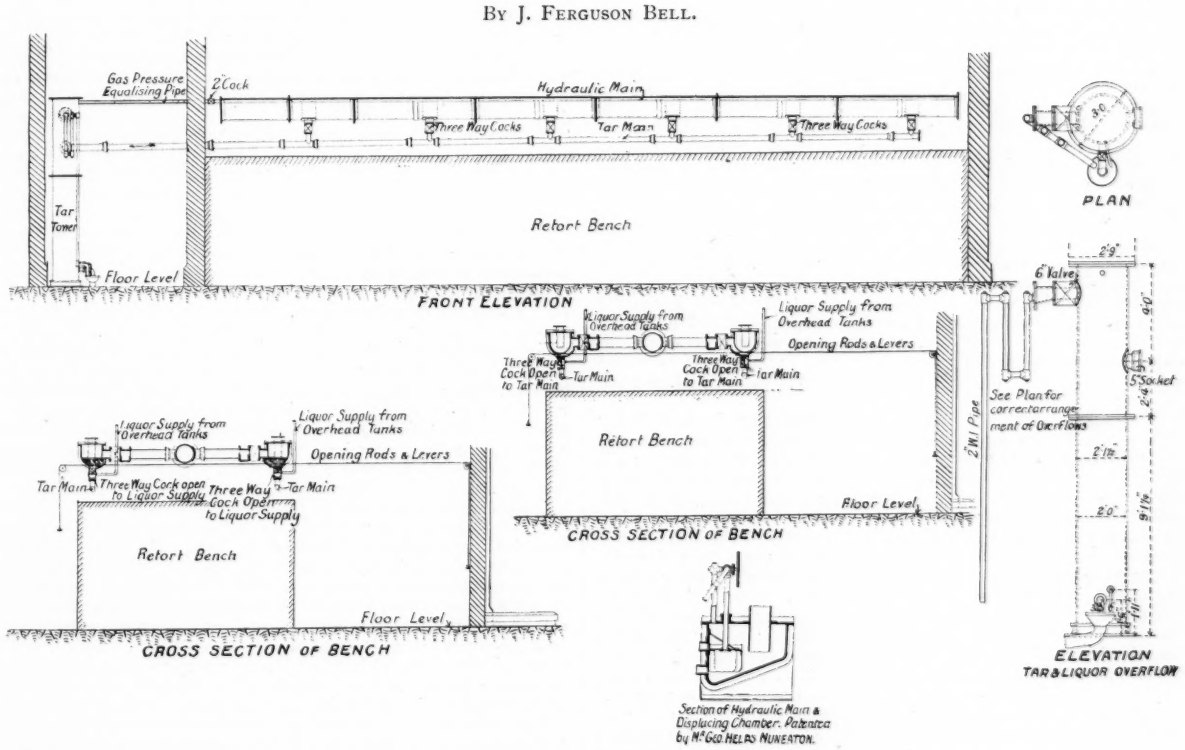
THAMES VALLEY AND GORING COMPANY: 14-candle gas. Sugg's No. 1 "London" argand.

Last, but not least, the "South Suburban," 13-candle gas, tested by Sugg's "London" argand burner No. 1, burning with a flame having an average height of 3½ inches, and with a 6-inch by 1⅞-inch chimney.

Can anything be more discrepant?

THE HYDRAULIC MAIN ARRANGEMENT IN USE AT DERBY.

BY J. FERGUSON BELL.



THE DERBY ARRANGEMENT OF HYDRAULIC MAINS.

I notice in last week's "JOURNAL" a letter from Mr. George Helps, of Nuneaton, in which a claim is made that my arrangement for regulating seals of dip-pipes in hydraulic mains is an infringement of his patent, along with Mr. G. F. H. Beard's patent No. 2861 of 1904. In order that your readers may judge of the value of Mr. Helps's claim, I herewith give a drawing and description of my arrangement as carried out at Derby, along with a sectional drawing of Mr. Helps's patent hydraulic main.

It will be seen the only similarity between the two is that they are both anti-dip arrangements, of which there are already a good number; and, as a matter of fact, mine is a further development of the now well-known Dillamore tar-columns, by which the tar is automatically withdrawn from the hydraulic mains as produced and replaced with weak ammoniacal liquor. I was one of the first to use these columns, as when at Stafford Mr. Dillamore came to me, now fifteen or sixteen years ago, which was soon

after he had perfected his arrangement and brought same into successful use at a carbonizing works near Tamworth, where Mr. Dillamore was manager. He informed me that, in order to obtain a high yield of benzol, it was necessary to carbonize at very high heats, which caused the hydraulic mains to get rapidly pitched up with thick tar and pitch; and he was bothered with stopped pipes. It was consequent on this difficulty that Mr. Dillamore was forced to devise some method of recovering the tar from the hydraulic mains as soon as formed, so as to prevent it thickening and blocking up the ends of the dip-pipes, which brought in its train the well-known nuisance of stopped pipes. It is another illustration that necessity is often the mother of invention. Mr. Dillamore happily applied the principle that liquids of greater density will give place to those of less density, and devised the now well-known Dillamore tar-columns, which act in a similar manner to an ordinary circulating hot-water system, as the tar, being the heavier liquid, flows by gravity to the columns or receivers fixed at the end of the retort-bench, and is replaced by ammoniacal liquor—continuous circulation taking place.

Mr. Dillamore desired that I should test his arrangement and ascertain if any benefit was to be derived from its use in gas-works, as he found it in carbonizing works a complete cure for both pitched mains and stopped pipes. At Stafford, I found the system most beneficial, as it practically cured us of both these evils. Hence, when I came to Derby, one of my first alterations was to introduce the Dillamore columns at both our Cavendish Street and Litchurch works; and later, in consequence of the reports from various sources of the increase in make of gas obtained by working with either dry mains or anti-dip appliances, I devised the arrangement as illustrated for either removing the seal altogether or working with seals of any desired extent. I must confess that so far I have not obtained all the benefit anticipated; and those companies who have their gas rigidly tested by independent—and sometimes, unfortunately, antagonistic—bodies will do well to be careful in introducing either dry mains or anti-dips, unless they can maintain at all times a perfectly even gauge in the retort-house. In fact, I am of opinion that a necessary adjunct is a governor on each inlet to the condenser, first introduced by Mr. Charles Carpenter, the Chief Engineer of the South Metropolitan Gas Company.

The following is a description of my arrangement, along with the method of working it. On the outside of the bottom part of the hydraulic main is attached an ordinaary three-way cock, 3-inch bore, so that the tar and liquor contents of the main may be withdrawn wholly or in part as required by the throughway of the cock. This is connected to a 6-inch main pipe underneath the hydraulic main, which carries away the tar and other liquor. The third way in the body of the cock is placed at right angles to the throughway, and is connected to a liquor or water supply, which is used to fill up the hydraulic main when necessary. This latter supply is connected to a main running above the hydraulic, and supplied either by a pump direct or by an overhead cistern. Through retorts being in use, the two throughway cocks opposite each other on either side of the bed are connected together by a chain and rod, so that they are opened and shut together. A lever is attached to the square head of the plug of the cock, and by wire rope is connected over a pulley and brought down to be easily reached from the floor of the retort-house. In this way, the two cocks on either side of the bench are opened for emptying or filling simultaneously. The liquid contents of the hydraulic main are drawn off into a Dillamore tower, the seal-valve thereto attached regulating the amount of liquor withdrawn from the main; and on filling the hydraulic main, the weir-valve attached to the hydraulic main regulates the amount of seal, when such is desired.

The general way of working the arrangement is as follows: When the retorts are closed for carbonizing, the lever attachment is moved so that the throughway of the plug of the cock is open between the hydraulic main and the take-off tar and liquor main. The contents of the hydraulic main then fall to the height of the weir-valve on the tar-column, or they may be withdrawn altogether. The seal will now be a very light one, or none at all, as desired, and will remain thus until the time arrives for recharging the retorts; the third way in the plug being closed against the side of the body of the cock. Shortly before the time comes for recharging the retorts, the lever is again operated so that the throughway of the cock is closed; and by means of the third way of the cock, communication is opened between the hydraulic main and the liquor supply. Half of the throughway will now take the liquor, and by the third way of the cock will supply liquor to the hydraulic main, which will then fill up to the seal required and set by the weir-valve attached to the hydraulic main. The other half of the throughway of the cock is now closed against the body of the cock, and communication is cut off between the hydraulic main and the tar and liquor main underneath. When the retorts are again charged, the lever is again moved, bringing the cocks into operation, and the seal is reduced or removed.

From the foregoing description and drawing, it will be evident to your readers that the alleged infringement only exists in Mr. George Helps's imagination. There is no similarity whatever between the two methods of operation; and surely because Mr. Helps, like many others before him, has taken out a patent for adjusting the seal in hydraulic main dip-pipes, it is open to anyone to devise what in their judgment appears a simpler, cheaper, and better method.

A LONG HIGH-PRESSURE GAS-MAIN.

EARLY last year, some particulars were given in the "JOURNAL" (Vol. LXXXV., p. 18) of the distribution of gas at high pressure from the Lubeck Gas-Works to Travemunde, a place upwards of 12 miles distant. Herr Hase, the Manager of the Lubeck Gas-Works, has now given, in a paper published in a recent number of the "Journal für Gasbeleuchtung," some interesting information on the further working of the system. The output of gas is shown for each month, both for lighting and for heating purposes, for the twelve months ending August last. The consumption rose considerably in the summer months, owing to that being the season for the baths at Travemunde, and naturally at that time of year the rise was chiefly in the consumption for cooking and heating. The total output in 1904 would, it was estimated in the paper, be about 4,750,000 cubic feet, of which 20 per cent. would be for public lighting, 45 per cent. for private lighting, and 30 per cent. for cooking and heating.

The most important factor in a high-pressure supply is perhaps the power or pumping station, which clearly must have a reliable equipment, with ample reserve. Two blowers are provided, one of which is mounted in place for use, and the other stands aside as a reserve. It can be substituted for the one in use in the course of an hour, should anything occur to make the change necessary. Hitherto the one has worked without need for change. There are two 3-horse power motors—one a gas-engine which is used in regular working, and the other an electromotor as a reserve. The blowers are not used more than can be avoided, as it is more economical to work with only the gasholder pressure as far as may be. At the present time, the blower is kept in action from about 7 to 9 o'clock in the morning, to fill the gasholder at Schwartau, which is a place $3\frac{3}{4}$ miles out on the way towards Travemunde. Then for the next one or two hours the blower is in action helping to fill the Travemunde holder, and for the remainder of the twenty-four hours the latter is filled merely by the holder pressure at Lubeck. The gasholder pressure at Lubeck is 5·4 inches; and the holders at Schwartau and Travemunde throw 1·8 inches. The gasholder pressure alone suffices to send through the main, which is 80 millimetres (3·15 inches) in internal diameter, 795 cubic feet of gas per hour as far as Schwartau ($3\frac{3}{4}$ miles) or 440 cubic feet as far as Travemunde (nearly 12 miles). With the blower making 444 revolutions per minute, and giving an initial pressure of 51 to 55 inches, from 3355 to 3532 cubic feet of gas are pumped per hour to Schwartau, and with the same number of revolutions, and an initial pressure of 98 to 102 inches, 2470 cubic feet per hour reach Travemunde. In practice, however, such high speeds are not yet used, but may be when the necessity arises. At present, 400 revolutions per minute is the maximum employed; and with an initial pressure of 59 to 63 inches, 1765 cubic feet of gas are pumped per hour to Travemunde. The cost of pumping the gas is not yet definitely established; but the cost per 1000 cubic feet of gas delivered, whether by pumping or by gasholder pressure, has so far averaged about 0·34d.

The main consists of Mannesmann pipes, well coated with bitumen, with socket joints, and with two turns of hemp. These pipes were chosen in preference to cast iron because of the greater risk of fracture with the latter, and the difficulty of locating it on such a long stretch of main, with the risk even of complete interruption of the supply should a serious fracture occur. It remains to be seen whether the bitumen and hemp wrapping will be sufficient protection for the pipes against corrosion. Up to the present, they are in perfect condition. It is doubtful, however, whether the ordinary socket joints are so suitable with these pipes as with cast iron, and probably some special sockets would prove better for such work. The unaccounted-for gas amounts to only between 1·5 and 2·5 per cent. of the volume delivered into the main at the Lubeck works.

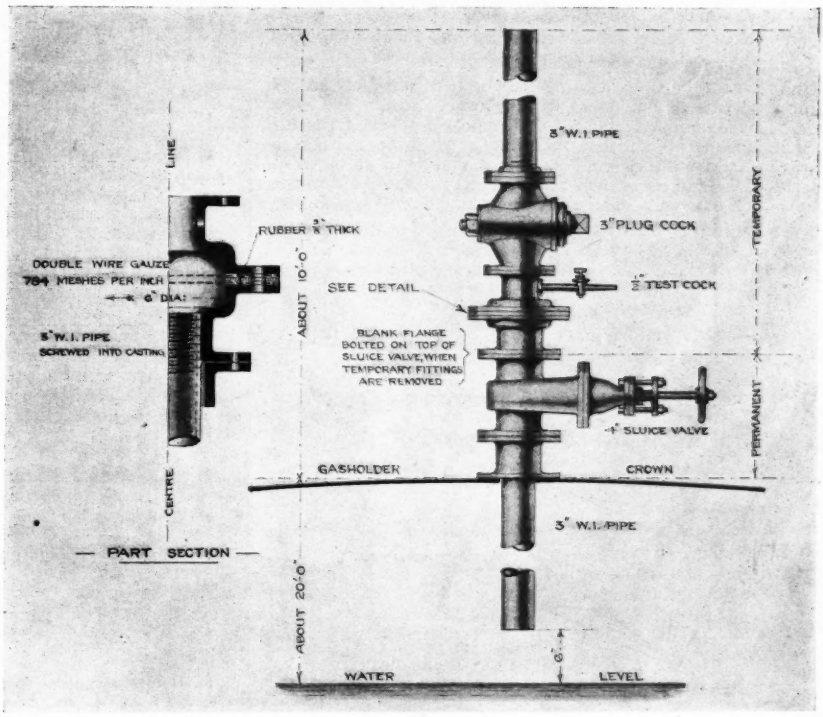
Financially, the undertaking has been very successful. Schwartau and Travemunde require only one attendant each, who is a superior fitter, acting as "Jack of all Trades." The works cost of gas at Lubeck, inclusive of all charges there, is nearly 1s. 1d. per 1000 cubic feet; and the cost after distribution at Travemunde or Schwartau is less than 1s. 8½d. The price charged is 5s. 8d. per 1000 cubic feet for lighting, and 4s. 3d. for other purposes; and the mean price obtained works out at about 4s. 10d. So that there is about 3s. 1½d. available as gross profit. After ample allowance for interest and depreciation charges on the installation, there remains a considerable surplus.

One advance leads to another; and it is now intended to attach to the gas-distributing station at Travemunde an electricity supply and a hydraulic power works. The dynamos are to be driven by gas-engines, using the gas supplied from Lubeck, and the water-pumps will be worked by electromotors. When these developments are accomplished, it will be necessary to lay a second high-pressure main from Lubeck.

High-Power Gas-Engines in San Francisco.—According to the "Western Electrician" of Chicago, the California Gas and Electric Corporation of San Francisco have placed an order with the Crocker-Wheeler Company for three 4000 kilowatt three-phase 13,200-volt alternators, to be driven by 6000-horse power gas-engines built by the Snow Engine Company.

ARRANGEMENT FOR BLOWING OFF AIR FROM GASHOLDER CROWNS.

The short article in the "JOURNAL" for the 10th inst., on "Safely Expelling Air from Gas Plant," has attracted the attention of, among we hope many others, Mr. W. Doig Gibb, the Engineer of the Newcastle and Gateshead Gas Company; and he has forwarded a drawing (which is self-explanatory) of the system he has adopted in blowing air from either old or new gasholders. The plan is interesting and simple; and there is no doubt it will be found useful by many readers.



Looking at the sketch, the permanent blow-off valve attached to the crown of almost every gasholder is shown next to the section of the holder crown; and on the top flange of this valve is bolted the special apparatus employed in blowing off. This consists of a long tail tube, the length of which can be varied so that, when the apparatus is in position, the bottom end of it will be within about 6 inches of the water-level in the tank. This tail-piece is threaded through the open permanent valve, and is connected into a special box, the detail of which is given. This box is made in halves; and between these are held two layers of suitable wire gauze. On the top of this special box is bolted an ordinary plug cock; and on the top of this again a length of pipe, which is necessary to carry the blowing gas into the air at a safe height from any chance sparks, &c. Even if the gas should be fired at the top, it will be arrested by the two layers of wire gauze in the box.

Above this gauze and between it and the plug cock, a ½-inch test-cock is provided, from which to draw off samples of the gas to be tested. This can either be done when the gas is being blown off, or, if there be not sufficient pressure then to inflate the rubber bag, the cock at the top can be closed for a moment. After the tests show that the gas is sufficiently pure, the bolts in the flange connecting the special box to the permanent sluice-valve are taken out; and the special apparatus quickly picked out of the holder by a pulley attached in a suitable way to a line stretched across the framework. In case of any tampering with the permanent sluice-valve, Mr. Gibb thinks it is well to bolt a blind flange on the top of the sluice-valve, even if this is closed. Such a special arrangement is not costly, and is useful where a Company possess any number of holders.

OBITUARY.

We regret to record the recent death, as the result of an attack of apoplexy, of Mr. W. H. WORSLEY, the Manager and Secretary of the Golborne Gas Company. Before taking this appointment, 14 years ago, he had had experience in gas-works at Hindley, in South Wales, and at Hyde. Under his management at Golborne, considerable extensions of the works and development of the business were effected. Mr. Worsley was a member of the Manchester District Institution of Gas Engineers, having been elected at the May meeting in 1898. He died at the early age of 43, leaving a widow, a son, and a daughter.

PERSONAL.

Of the total number of candidates for the position of Superintendent of the Neepsend works of the Sheffield Gas Company, in response to the advertisement which appeared in the "JOURNAL" a few weeks ago, four were selected as being the most suitable; and the choice of the Directors has fallen upon Mr. JOHN POWER, Assistant to Mr. J. Ferguson Bell, the Engineer and Manager of the Derby Gas Company. Mr. Power has been in the Company's service for upwards of 18 years; for about 8½ of which he was engaged at the Litchurch works, first under the late Mr. William Dewsbury, and afterwards under Mr. Thos. Berridge, from whom he received his training. He was subsequently for twelve months draughtsman; and in 1897 he was appointed Assistant to the late Mr. Charles Taylor, on whose retirement in 1900 he filled a similar position with Mr. Bell. Mr. Power has seen a considerable development of the Company, and has been intimately associated with the work in connection with Mr. Bell's naphthalene process and the installation of the De Brouwer stoking machinery at the Cavendish Street works, of which he has charge under the general supervision of the Engineer, and which have proved so complete a success. Apart from these strictly practical duties, Mr. Power has been Lecturer on "Gas Manufacture" at the Municipal Technical College in Derby since 1897. He holds about 35 certificates, among which 23 are from the Science and Art Department, South Kensington, and seven from the City and Guilds of London Institute. Included in the latter are a certificate first class and bronze medal in "Gas Manufacture," ordinary grade, also a first class full honours certificate on the same subject, a first prize and silver medal in "Mechanical Engineering." We have had an opportunity of following Mr. Power's progress in his profession, and cordially wish him success in his enlarged sphere.

Casualties in Tar-Distillation Works.

Our readers may remember that in October, 1903, a memorandum was issued by the Home Office, and was given in the "JOURNAL" at the time, calling attention to the serious risks incurred by persons employed in works in which the distillation of tar is carried on, and where naphtha, light oil, creosote oil, and pitch are produced. Certain precautions were suggested, and they have, generally speaking, been accepted as necessary, and adopted in practice. It has been found, however, that in certain cases some modification of the fifth paragraph is needed; and Mr. Sydney Smith, one of the Inspectors of Factories, has been in communication with the occupiers of all works concerned. As originally framed, the paragraph ran as follows:—

> No person or persons should be allowed to enter a tar still or tank unless provided with a belt securely fastened round the body, with a rope attached, the free end to be left with two men outside, whose sole duty should be to watch and draw out any man in the tank should he appear to be affected by gas.

As the result of Mr. Smith's action, the paragraph has been amended to read as follows:—

> The inspecting foreman on first entering any tar still or tank, and all persons employed in tar stills or tanks in which there are no cross stays or obstructions likely to cause entanglement, should be provided with a belt securely fastened round the body, with a rope attached, the free end being left with two men outside, whose sole duty should be to watch and draw out any person appearing to be affected by gas. The belt and rope should be adjusted and worn in such a manner that the wearer can be drawn up head foremost, and through the manhole and not across it.

MANCHESTER DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of this Association was held at the Manchester School of Technology last Saturday, when a paper on "How to Design a Roof Principal" was read by Mr. C. E. TEASDALE, of Manchester, before a good attendance of members.

Mr. TEASDALE began by stating that he had purposely altered the original title of the paper from "Roofs" to the one given above because he found that the former would take a great deal longer time for treatment than there was at his disposal. Therefore, as he had been requested by the Council to give a paper on this subject, he had chosen the above, as it was the most important part. If one could design the principal, the rest was an easy

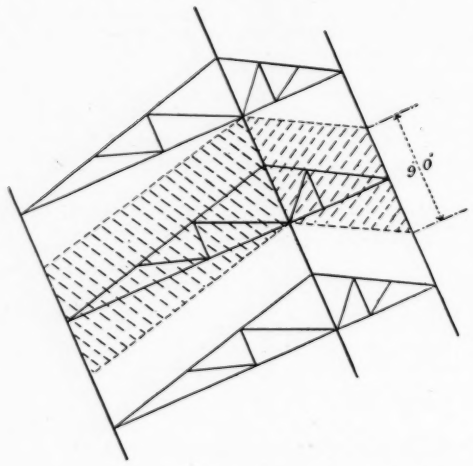


FIG. 1.

matter. He then went on to say: For the purpose of the paper, the principal to design is one of 58 feet span, with an over-all dimension of 60 feet; thus giving 1 foot bearing with a wall at either side with principals set at 9 feet centres. The first thing to ascertain is the load acting on each principal. The loads on a roof are partly permanent and partly occasional. The greatest natural load which can come on a roof is when it is covered with snow; and the greatest pressure when one-half of it is exposed to a violent gale. The permanent load consists of the weight of slates, the purlins, the louvres, and all the framework; while the occasional load consists of the maximum wind or snow pressure to which the roof may be subjected. For the permanent load take 9 lbs. per square foot for the structure, which includes all framework and purlins, and for the slates take 5 lbs. per square foot; for the occasional or accidental load take 36 lbs. per square foot area normal to the surface of the roof as the maximum wind pressure. The weight of snow is usually disregarded in this country, on the supposition that it is not likely to happen at the same time as the maximum wind pressure. According to Mr. Glaisher, during a period of twenty years at the Royal Observatory, the greatest wind pressure was recorded as blowing from east to west—equal to 28 lbs. per square foot. The highest wind pressure in the country has been 55 lbs. per square foot, blowing in a horizontal direction; but the maximum wind pressure is taken as 50 lbs. per square foot of vertical surface. The ordinary direction of the wind is horizontal, or nearly so; but as fluid pressure is always exerted at right angles to the surface upon which it acts, so with the wind, which acts normal to the surface of the roof. Therefore the horizontal force must be resolved into a force acting vertically with the slope of the roof. Taking 50 lbs. per square foot as acting on a surface perpendicular to the direction of the wind, and multiplying by 0·66, the tabular number, by Unwin's formula, for a roof of 30° pitch, as adopted in the present case, we have $50 \times 0{\cdot}66 = 36$ lbs. per square foot acting normal to the surface; and we have a total load per square foot of—

Structure	9 lbs.
Slates	5 ,,
Wind pressure	36 ,,
	50 lbs.

Then we have a total load on one principal of 50×34 ft. 8 in. $\times 2 \times 9$ ft. $= 31{,}194$ lbs. $= 13{\cdot}9$ tons—say, 15 tons load.* The 34 ft. 8 in. is the length of one rafter set 9 feet centres as shown in fig. 1. The shaded portion is the area supported by one principal—viz., each principal carries half the load in the portion of roof between it and the next truss. We then set out a line diagram of the principal of approved design, as in fig. 2, which is a style largely adopted in this country. The method of apportioning the load, which is a distributed one, is—

$$\frac{\text{Load}}{\text{Number of bays}} = \text{W, or the load on each bay.}$$

Therefore each bay, or that portion of the rafter between each joint, is like a girder supported at both ends, and bearing a distributed load; half the weight going to each support. Then on each intermediate joint we get a load W, and on each end joint $\frac{W}{2}$, or half the load on a bay.

Having lettered the frame diagram according to Bow's notation—that is, each space bearing a letter, we proceed to make the

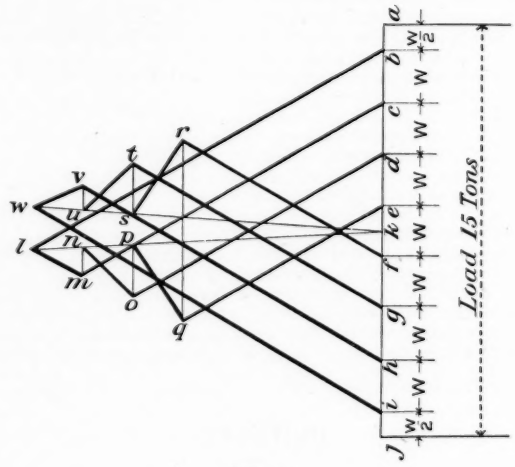


FIG. 3.

strain diagram (fig. 3). First set down a vertical line $a\,j$ equal to the total load, 15 tons, at a convenient scale—say 4 tons to an inch. Then, there being eight bays, divide this into eight equal parts. One part being equal to W, from j and a set off half a part, $j\,i$ and $a\,b$, equal to $\frac{W}{2}$, and the other seven parts equal to W as $b\,c$, $c\,d$, $d\,e$, &c. From these points draw lines $b\,l$, $c\,m$, $d\,o$, and $e\,q$, parallel to the rafters, lines $l\,m$, $m\,n$, $n\,o$, $o\,p$, $p\,q$, and $q\,r$, parallel to the struts and tie-rods respectively, and lines $l\,k$, $n\,k$, and $p\,k$, parallel to the main tie-rods, and so on with the other half of the principal. These should form a diagram as shown; the lettered lines in the latter corresponding with the frame diagram. Then

* This 15 tons was taken in error in place of 14 tons.

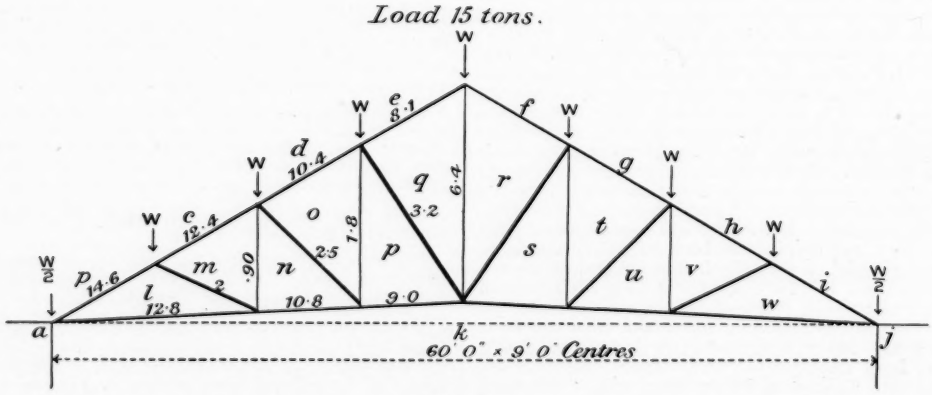


FIG. 2.

by scaling, the strains on any member can be obtained due to a load of 15 tons. For example, the load on that part of the rafter *b l* as measured in the strain diagram is 14·6 tons, &c. The thick lines in the diagram denote the members in compression; the thin ones those in tension.

The rule for finding (according to Clerk Maxwell's system) whether a member is in compression or tension is as follows:

1.—Read off the letters on either side of the member in question in the frame diagram in the order in which you meet them when revolving round either joint connected with that member in the direction employed for lettering the diagram.

2.—Put an arrow on the corresponding line in the strain diagram pointing from the first letter to the second named above.

3.—Transfer this direction back to the frame diagram. If the arrow points towards the joint, that member is in compression, but if it points away from the joint it is in tension. (N.B.—The direction of the arrow must only be taken to refer to the joint round which the revolution was made.)

Knowing the strain and the kind of force acting on the various members, we must find material of sufficient strength to withstand these forces. It is usual in roofs up to 60 feet span to use T-steel rafters and struts, and round steel bars for the tie-rods, 3½ tons per square inch for the rafters and 1½ tons for the struts. It has been found by practice that these are safe factors. If 6 tons were taken as the factor of safety throughout, the whole thing would be too flimsy; hence we put in much stronger struts and rafters to impart rigidity to the truss, and give them strength to resist any tendency to bend owing to the compression in that member. The maximum strain on the rafter is 14·6 tons. The area required is $\frac{14{\cdot}6}{3{\cdot}5} = 4{\cdot}17$ square inches. The area of $4 \times 4\frac{1}{2} \times \frac{5}{8}$ T.S. at the smallest section, that is, in this case, with one rivet deducted = 4·45 square inches; thus showing a margin in area—it being better to err on the excessive side. The following table shows the area required and the area adopted in the rafters and struts:—

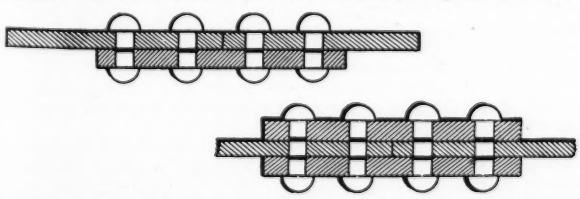
Member.	Strain as by Diagram.	Area Required. Sq. In.	Area Adopted. Sq. In.*	Size of Bar.
p t rafter . . .	max. 14·6	4·17	4·45	$4 \times 4\frac{1}{2} \times \frac{5}{8}$ T.S.
l w ,, . . .	,, ,,	,,	,,	,, × ,, × ,,
l m strut . . .	2·0	1·33	1·87	$3 \times 3 \times \frac{3}{8}$ T.S.
r w ,, . . .	,,	,,	,,	,, × ,, × ,,
n o ,, . . .	2·5	1·66	1·87	,, × ,, × ⅜ T.S.
t u ,, . . .	,,	,,	,,	,, × ,, × ,,
p q ,, . . .	3·2	2·13	2·87	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{1}{2}$ T.S.
p s ,, . . .	,,	,,	,,	,, × ,, × ,,

* The figures given include the deduction of the rivet or bolt-hole as the case may be.

The strains, area required, and area adopted in the tie-rods or those bars in tension, are shown in the following table; the factor of safety being 6 tons per square inch:—

Member.	Strain as by Diagram.	Area Required. Sq. In.	Area Adopted. Sq. In.	Size of Bar.
l k	12·80	2·13	2·40	1⅝ in. diameter
w k	,,	,,	,,	,, ,,
n k	10·80	1·80	2·07	1⅜ in. ,,
u k	,,	,,	,,	,, ,,
p k	9·00	1·50	1·76	1½ in. ,,
s k	,,	,,	,,	,, ,,
m n	0·90	0·15	0·44	¾ in. ,,
u v	,,	,,	,,	,, ,,
o p	1·80	0·30	0·78	1 in. ,,
s t	,,	,,	,,	,, ,,
q p	6·40	1·06	1·48	1⅛ in. ,,

One thing that should be noticed in designing a roof principal is that the greater the rise given to the main tie-rods the greater the strain produced on the rafters. In designing the joints for the struts, tie-rods, &c., care must be taken that sufficient area is given in all cleat plates, rivets, bolts, &c., to withstand the strain acting on the member it secures. Consideration must be had as to whether the rivets are in single or in double shear. Rivets are said to be in single shear when only one joint plate is used, or a lap joint, and in double shear when the two joint plates are used.



The thick lines show clearly where the shearing force is executed. Therefore it is evident that a rivet in double shear is twice as strong as one in single shear; or to withstand the same strain, twice the number of rivets of the same area will be required in the first figure as in the second. Taking the factor of safety for rivets and bolts as 6 tons per square inch, then, for example, with a strain of 3·2 tons on the strut *p q*, the combined area of the two bolts, if they were in single shear, would be 3·26 ÷ 6 = say, 0·6 square inch; but as they are in double shear, the combined area required would be half the above—viz., 0·3 square inches. On the drawing, ¾-inch bolts are used, having a combined area of 0·88 square inch; thus being much stronger than required.

It is usual to brace large iron roofs diagonally, to enable them to resist the effects of the wind blowing at an angle with the axis of the roof in an oblique direction. The principals are also stayed together by a tie-rod running longitudinally, fastened to each centre-plate, the size of which in the present case is figured as 1-inch diameter.

The crippling strain of a strut fixed at both ends can be obtained by Shaler Smith's formula, which is for a strut fixed perpendicularly. The same form will do for a sloping strut. When a bar is bent to such an extent that it exceeds its elasticity—that is to say, if a bar, after being bent, does not spring back, but has a permanent set—it is said to be crippled; hence the force to cripple the strut *l m* would have to be one of 25·4 tons, if the strut were acting vertically.

At the close of the paper,

Mr. GARLICK said a discussion upon it would take a great deal of time; and he therefore proposed that it should be postponed to a future date, when members had fully digested the paper.

A vote of thanks was passed to Mr. Teasdale.

GAS-ENGINES AT THE ST. LOUIS EXHIBITION.

OUR contemporary the "Engineer" has been giving a series of interesting articles on the St. Louis Exhibition; and in the current issue notice is taken of some of the gas-engines shown. Though the exhibits in this department were numerous and interesting, there were few new or special features. It was unfortunate that none of the three high-power European gas-engines originally promised were sent over; and there were no very large American engines. Those exhibited ranged from 2 to 200 horse power, and were suitable for all kinds of work—driving pumps, generators, machinery, yachts, and motor cars. In marine work, the Truscott Boat Company exhibited a 77-feet cruising yacht fitted with a 12-horse three-cylinder gas-engine; while the Hercules Gas-Engine Company showed the class of engine used on a number of coasting schooners and other sailing craft on the Pacific coast. The engines are employed partly for furnishing auxiliary power and partly for use in emergencies, but mainly for handling the boat when going in and out of harbour (thus avoiding the expense of employing tugs), or alongside a pier or wharf.

Most of the engines shown were designed to work with producer gas, natural gas, gasoline, and similar fuels. They were nearly all of the four-cycle type, with electric ignition. In the Callahan engine, the side shaft which controls the valve mechanism is driven by spiral gears from the main shaft, and the governor is so adjusted that, under light loads, the side shaft is disconnected, and the shaft, valves, and sparking mechanism are at rest until a charge is needed. The Columbus engine was shown with a pump mounted on the same frame, and having its plunger driven by a connecting-rod from a spur-wheel geared to a pinion on the crank-shaft. This is designed specially for railway water-supply stations. The Fairbanks and Morse Company exhibited a number of engines, from a 2-horse power to a 150-horse power three-cylinder vertical engine, operating pumps, hoists, dynamos, &c. There was also a portable engine for agricultural use. In the Foos engine the governing is usually of the hit-and-miss type; but for special electrical work and for the use of gas there is a throttling system consisting of a rotating valve operated by a centrifugal governor. The engine gets a full charge of fuel or no charge; there being no graduation by the governor. Three Nash engines were shown, each directly connected to a generator mounted on the same bed; and there were no less than seventeen of the well-known Otto engines. The Weber engine, supplied with gas from the Weber producer plant, is of the vertical two-cylinder pattern, directly coupled to a generator of 75 kilowatts.

Our contemporary considers that the most interesting gas-engine exhibit was that of the Westinghouse Company, who had two engines running on ordinary illuminating gas. One of these was a vertical engine of the type brought out a few years ago. It was of 125-horse power, with three single-acting cylinders, 13 in. by 14 in., and running at 265 revolutions per minute. It was directly connected to a generator of 75 kilowatts, 125 volts. The other engine was a two-cylinder tandem, of 200-horse power, with cylinders 14½ in. by 22 in. It was thus practically a double-acting engine, receiving an impulse at each forward and backward stroke. On the shaft was an 8-feet fly-wheel; and the engine ran at 200 revolutions, driving a direct-connected dynamo of 100 kilowatts. Cooling water was circulated through the pistons and piston-rods. In starting, compressed air was employed; being admitted to the rear cylinder, the valves of which were shifted by hand until the engine made its first stroke. All Westinghouse engines are on the four-cycle system; but instead of the usual hit-and-miss governor, a centrifugal one controls the speed by the admission at the beginning of each cycle of a definite mixture of air and gas, in quantity proportionate to the load.

Several makers of gas and gasoline engines exhibited motors

working with oil as fuel, either fuel oil, crude oil, or kerosene distillate, one of which—the Mietz engine—is adapted for marine work as well as for general power purposes. This engine uses kerosene in starting as well as in running, though many similar engines employ gasoline only in starting. Another special feature is that the heat from the cylinder is allowed to vaporize the water in the jacket, and the steam thus produced is passed into the cylinder with the charge of oil and air. Another interesting engine was the American Diesel oil-engine, which is on the same general principles as the German engine, but with some modifications. There were three three-cylinder engines, each of 225-horse power, directly connected to three dynamos. The average fuel consumption in the very variable load was 7·43 gallons per 100 horse-power-hours, or 10·4 gallons per 100 kilowatt-hours. The speed regulation is effected by varying the quantity of the charge.

In connection with gas-engines, it will not be out of place to mention that the R. D. Wood Company, of Philadelphia, had on view a 350-horse power pressure plant, operating on anthracite coal, and supplying a number of engines. A bucket conveyor on the producer raised the coal to an overhead bin, from which it was discharged into the magazine of a continuous automatic feed, which delivered it to the fuel bed in a continuous shower. The fuel bed was carried on a revolving grate, operated by hand; by turning the table the bed was kept level, and the ashes were removed as required. The crude gas passed to an economizer, where it heated the steam and air used in blowing the fuel bed. From this it passed through a water-seal into the vertical scrubber—a cylinder filled with coke, and having sprays of water, through which the gas passed on its way to the purifiers. The same Company had a similar plant operating a 260-horse power gas-engine, but using soft coal.

VALUE OF THE FLAME OF COMBUSTIBLES.

The investigations of M. Mahler into the subject of the calorific value of solid and gaseous fuels by means of his now well-known "calorimetric bomb," have been referred to from time to time in the "JOURNAL." The results of further researches are given in the current number of the "Journal of the Franklin Institute," in a translation, by Mr. B. S. Isherwood, of the U.S. Navy, of an article which appeared in the "Revue Universelle des Mines;" and we reproduce the following portions, as furnishing additional literature on the subject.

The author begins by remarking that the calorific power and the chemical composition are, in general, sufficient elements of comparison between natural combustibles. These data permit the calculation of the value of flames; and the question may be asked whether this has any practical utility. The value of the flame of a combustible is the same thing as its temperature of combustion under constant pressure. It is measured by the thermometric degrees through which the gaseous products of the combustion are raised, supposing them to be heated by all the heat due to the combustion and solely by it. It must also be admitted that the combustion is complete, and that it is realized by the aid of air under atmospheric pressure, always nearly constant, as it takes place on grates.

The preceding definition is in accord as much as possible with industrial conditions; but, in fact, the temperature of combustion is a theoretical number defining with precision a limit that practical industry cannot exceed with any given combustible and for the given bodies to be heated; and therefore it seems interesting to compare different coals from this point of view. The calorimetric bomb and the elementary analysis supplied M. Mahler with the necessary data for the calculation of temperatures of combustion; he subsequently determined the value of the flames of a complete series of combustibles. This was done without difficulty, and the method followed was an old one. The author, however, proceeds to describe it in some detail.

M. Mahler then gives the results of the application of the method. The mean value of the flames from sixteen substances was found to be 1986° C.; and therefore it seemed to him that 2000° might well be adopted as representing the theoretical temperature of combustion of any combustible whatever of vegetable origin. The results arrived at are as shown.

Combustibles.	Calorific Power.		Value of the Flame.
	Water Condensed.	Water Vaporized.	
	Calories.	Calories.	Deg. C.
Oak from Lorraine	4690	4370	1865
Peat from Bohemia	5900	5590	2020
Lignite from Trifail (Styria)	6650	6370	1960
Flaming coal from Blanzy (Ste. Marie)	8350	8060	1990
,, ,, Decazeville (Tramont)	7840	7530	1960
Oxidized coal from Commentry	6380	6200	1960
Gas coal from Commentry	8410	8110	1950
,, ,, Béthune	8670	8380	1990
,, ,, Lens	8740	8450	2010
Coking coal from St. Etienne (Treuil)	8860	8580	2010
Smithy coal from Roche-la-Molière	8860	8600	2030
Semi-bituminous coal from Anzin (St. Marc)	8660	8430	1980
Anthracite coal from Commentry	8460	8290	2030
,, ,, Kebao	8530	8370	2020
,, ,, Creusot	8690	8480	2010
,, ,, Pennsylvania	8266	8140	2000

It will be seen that the value in the table which is the farthest from the mean of 2000° is that of oak—1865°. The temperatures which are the farthest removed in excess from the mean are, in general, those of anthracite coal. The popular opinion has always been that anthracite has a hotter flame than coal; and the relative values of the flame sustain this opinion.

To the results given in the table can be added those M. Mahler found for different liquid combustibles, as follows:—

Ethylic alcohol and methylic alcohol	1700° C.	
Amylic alcohol	1850° C.	
Crude American petroleum	2000° (cal. power,	10,400.)
Essence of American petroleum	1910° (,, ,,	10,270.)
Refined American petroleum oil	1660° (,, ,,	10,280.)

Finally, below will be found the temperatures of combustion of several gases under constant pressure:—

	Deg. C.		Deg. C.
Hydrogen	1960	Acetylene	2350
Oxide of carbon	2100	Illuminating gas (mean)	1950
Methane	1850	Water gas, industrial	2000

An examination of the numbers grouped in this work shows the apparent paradox that, of two combustibles, the one having the greatest calorific power is not necessarily the one having the hottest flame. The flame of the essence of petroleum is relatively cold. The flame of the sample of peat appears hotter than that of the coal from St. Etienne, the calorific power of which is excellent. The flame of the oxidized coal from Commentry is a little better than that of the same coal not deteriorated.

Moreover, everything occurs in all cases, and notably for the combustibles of vegetable origin, as if the elements of the temperature of combustion, calorific power, elementary composition, volume, and composition of the gases of combustion, compensated each other, so as to give to all the combustibles flames of very nearly the same thermometric degrees. This, however, does not lessen the advantages due to the high calorific power of good coals, which is the true measure of their value, since the utilizable flame of a coal is a great deal more voluminous than that of a peat—a much oxidized matter, the combustion of which requires but very little air.

COMBUSTION OF ETHYLENE.

At a recent Meeting of the Chemical Society, a paper on the above subject by Messrs. W. A. Bone and R. V. Wheeler came before the members. The following is a brief abstract of the communication:—

The combustion of ethylene appears to be essentially a process of hydroxylation, that is, oxygen initially enters the hydrocarbon and is distributed between the carbon and hydrogen, giving rise to hydroxylated molecules, which sooner or later, according to the rapidity of the process, undergo thermal decomposition into simpler products. The more salient features of the authors' experiments may be summarized as follows.

1.—There is no preferential combustion of either carbon or hydrogen when ethylene interacts with a quantity of oxygen insufficient to burn it completely to steam and oxides of carbon. The separation of carbon or hydrogen, when it does occur, is to be entirely ascribed to secondary thermal decompositions.

2.—Formaldehyde is the most prominent intermediate oxidation product, and at low temperatures its formation is probably preceded by that of a less oxygenated product.

3.—The formation of aldehydes precedes that of steam and oxides of carbon.

4.—The stage in the combustion process at which secondary decompositions set in is determined entirely by the temperature conditions. Below the ignition-point, such changes do not come into play to any appreciable extent until the stage corresponding with the production of formic acid is reached. The greater part of this substance then decomposes into carbon monoxide and steam, while the remainder is further oxidized to carbonic acid, which in turn breaks down into carbon dioxide and steam. Above the ignition-point, the formaldehyde produced rapidly decomposes into carbon monoxide and hydrogen.

5.—There is no separation of carbon or liberation of acetylene, even in the explosive combustion of ethylene, except when the oxygen present is insufficient to burn the hydrocarbon to formaldehyde. In such circumstances, the excess of ethylene is thermally decomposed, yielding carbon, hydrogen, methane, and traces of acetylene. Some evidence was obtained under suitable conditions of the transformation of the initial product—$CH_2:CH\cdot OH$—into the isomeric acetaldehyde, which is then independently oxidized to carbon monoxide, water, and formaldehyde, as proved in a previous paper.

The authors have not yet decided whether at low temperatures the oxygen is conveyed to the hydrocarbon directly or indirectly; but at high temperatures—as, for example, in the explosion wave—it is believed that there is a direct passage from

$$\begin{matrix} H\cdot C\cdot H \\ \| \\ H\cdot C\cdot H \end{matrix} \quad \text{to} \quad \begin{matrix} H\cdot C\cdot OH \\ \| \\ H\cdot C\cdot OH \end{matrix},$$

as the result of collisions between single molecules of ethylene and oxygen.

THE MANUFACTURE OF CYANIDES.

The manufacture of cyanides from ferrocyanides is the subject of three patents granted to Grossmann's Cyanide Patents Syndicate, Limited. According to the first—noted in the "JOURNAL" for the 22nd of March last (p. 775), the English patent, No. 4513 of 1903—a saturated solution of potassium ferrocyanide ($K_4Fe[CN]_6$) is heated by live steam, with a slight excess of dilute sulphuric acid, or other suitable acid or acid sulphate, in a partial vacuum. The hydrocyanic acid evolved is collected in a solution of an alkali hydroxide, or in milk of lime, if calcium cyanide is desired. Or the gas may be absorbed by a solution of potassium or sodium sulphate with lime. The Everitt's salt ($K_2FeFe[CN]_6$) remaining in the still after the distillation is boiled with a solution of suitable ferric salt in the presence of free acid, and the prussian blue thus produced is separated by filtration or otherwise from the ferrous salt in solution. The ferrous salt (or other suitable corresponding salts of low oxidation) may be utilized for the conversion of another portion of Everitt's salt into prussian blue ($Fe_7[CN]_{18}$) in acid solution with injection of air. The prussian blue is converted into a soluble ferrocyanide by boiling with an equivalent quantity of caustic alkali.

According to a French patent (No. 331,331 of 1903) potassium ferrocyanide is heated in a leaden still—with dilute sulphuric acid, for instance—and the hydrocyanic acid evolved is collected in milk of lime, to which is added a proportionate quantity of an alkali sulphate, whereby a solution of an alkali cyanide is obtained on filtration. Part of the cyanogen in the ferrocyanide treated remains behind an insoluble iron and potassium ferrocyanide (Everitt's salt). This is boiled with an alkaline lye, or with a solution of an alkaline carbonate or of an alkaline earth hydroxide, or with a mixture of these, in slight excess; a current of air being continuously passed through the boiling liquid. The potassium ferrocyanide ($K_4Fe[CN]_6$) is thus reproduced from the Everitt's salt ($K_2FeFe[CN]_6$).

According to another patent, in the preparation of hydrocyanic acid from potassium ferrocyanide and dilute sulphuric acid, half of the cyanogen remains behind in the form of ferrous potassium ferrocyanide (Everitt's salt), and can only be very imperfectly reconverted into ferrocyanide by the action of alkali hydroxide. If, however, a slight excess of alkali hydroxide is added, and air is blown through the suspended mass, the conversion into ferrocyanide takes place rapidly and quantitatively. The remaining iron is precipitated in the form chiefly of triferric tetroxide.

Mr. J. H. Paul, according to his English patent (No. 72 of 1903), has devised a process of cyanide manufacture by which calcium ferrocyanide is heated with sulphuric acid to produce hydrocyanic acid gas, which is led into a solution of potassium or sodium hydroxide to obtain a solution of the corresponding cyanide. The loss involved in the similar use of potassium ferrocyanide, owing to the formation of a potassium iron ferrocyanide, which is only attacked with difficulty, is thus avoided.

Herr J. Tcherniac, of Freiburg, produces cyanides from sulphocyanide according to his English patent (No. 17,449 of 1903). In manufacturing cyanides by oxidizing a sulphocyanide by nitric acid, &c., as directed in the English patent No. 17,976 of 1902, it is now directed to pass the washed gaseous mixture, containing hydrocyanic acid and nitric acid vapour over a salt or oxide (such as anhydrous sodium sulphate or alumina), which reacts or combines with nitric acid, but has little or no effect on hydrocyanic acid. The absorption of this acid is effected by an alkali hydroxide heated to a temperature below its melting-point, but above that at which the water generated by the reaction is completely vaporized. In using caustic soda for this purpose, it is first heated to about 200° C, and finally to about 300°.

HELMET RESPIRATORS FOR SAVING LIFE.

The essential conditions of respiratory apparatus for use in noxious gases and smoke have been discussed by Herr B. Dräger in a recent number of "Glückauf." He considers that the apparatus, in order to furnish a continuous and sufficient supply of pure air for breathing, must fulfil three principal requirements—viz.: (1) Supply air for inhalation and exhalation in sufficient quantity for hard work to be performed, (2) dispose of the exhaled carbonic acid, and (3) make good the oxygen consumed in the lungs. The oxygen admixture and the carbonic acid removal present no insuperable difficulties, and have been accomplished in apparatus which is in use at many gas-works, &c. Observations were, however, wanting as to the amount of air required for respiration; and it was assumed that 8 to 12 litres were inhaled and exhaled per minute. But the further assumption that a respiratory apparatus which would supply 16 to 21 litres of pure air per minute would suffice in all cases, was found erroneous. Herr Dräger has ascertained that it is insufficient even for moderate work, and that, when running or doing heavy work, a man consumes 30 to 61 litres of air per minute. Hence a life-saving respiratory apparatus must be competent to supply on the average 45 to 50 litres of air per minute, and on emergency as much as 60 litres.

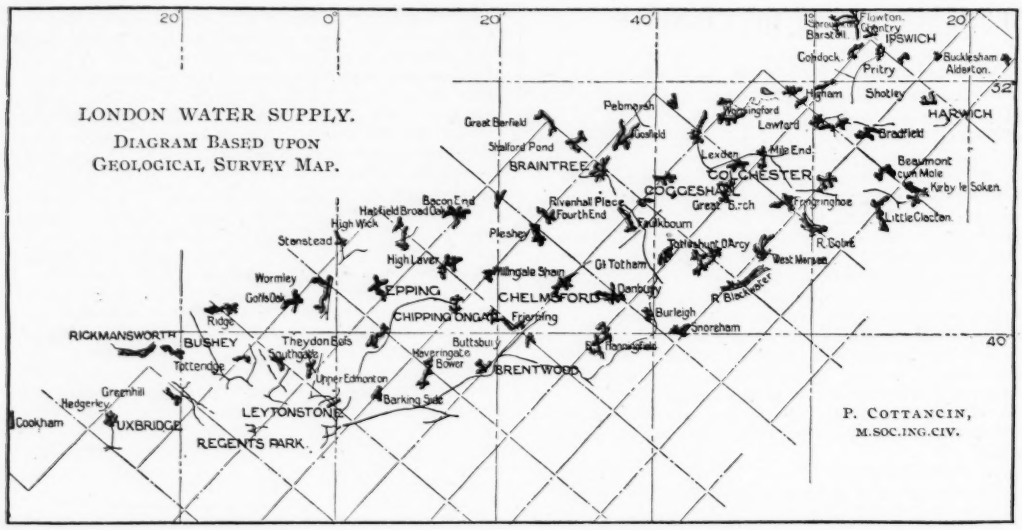
For absorbing carbonic acid, potash cartridges or sticks are recommended, as they will keep the air supplied practically free from carbonic acid for a period of two hours. The oxygen supply is maintained from cylinders of the compressed gas. The apparatus, as arranged by Herr Dräger, comprises oxygen cylinders with delivering and circulating arrangements, potash cartridges, and an air-tight helmet. The necessary flexible connections are short and wide, and two separate breathing bags, with valves, are provided in order to avoid admixture of the purified air for inhalation with the vitiated exhaled air. The valves are best made of mica discs. It has been suggested, elsewhere, that a respiratory apparatus need contain only sodium dioxide in place of both the potash and the oxygen cylinders. This compound is formed when metallic sodium is heated in dry air or oxygen. It was produced and exhaustively studied over forty years ago by Mr. A. G. Vernon Harcourt, who showed that it absorbed carbonic acid with liberation of oxygen, thus—$Na_2O_2 + CO_2 = Na_2CO_3 + O$. It is therefore an ideal material for counteracting the change of composition which air undergoes in its passage through the lungs; and recently apparatus containing it has been devised in Germany for the use of persons who have to enter places where the air is too foul for breathing. Some such apparatus is almost necessary on large gas and chemical works for the rescue of men when overcome by accumulations of coal gas, producer gas, &c.

LONDON'S STORE OF UNDERGROUND WATER.

Some of our readers may possibly be familiar with the Cottancin system of tank construction, in which steel-cored brick and cement are the principal materials employed. It is largely used in France and on the Continent for circular and other reservoirs; and one built at Nemours on this system was described in the "JOURNAL" for Dec. 9, 1902. The matter is referred to now for the purpose of introducing M. Cottancin in another capacity than that of engineer. In the current number of "Public Works," he offers a few remarks on a suggested new source of water for London. He has evidently gone into the subject with much care, and, by permission of the Editor of our contemporary, we reproduce his article, with the interesting diagram prepared by him to illustrate it (see p. 232); leaving our readers to form their own conclusions as to how far his theories are justified as to the extent of the stores of water under London.

M. Cottancin begins by explaining how he came to take up this question, which for the past few years has been in abeyance. He says that during the driving of galleries for water-works, he noticed that in France all important rifts in sedimentary earth appeared to follow two directions—north-east to south-west, and north-west to south-east. The idea then occurred to him of tracing these directions on a map of the world; and he thus found a point where water descended in four directions—north-east to south-west, south-west to north-east, north-west to south-east, and south-east to north-west. Only one point on the earth, however, fulfils this condition—the great desert of Gobi, surrounded by the plateau of Pamir and of the Indus. In M. Cottancin's opinion, this fact may be easily explained in this manner: Assuming that the site of the desert named was the point at which the molten earth first commenced to solidify, and which, sinking in the molten mass, caused failure of the thin crust on the surface something after the manner of a vault, giving rise to surfaces of parallel cleavage, it may be supposed that the depression of the site of the desert would raise the sites now forming the neighbouring plateaus of Pamir, Himalaya, Mont Peling, Mont King Chan, and Mont Altai. Further, he concludes that the rifts, formed in the manner suggested, are those in which streams of water flow in the four directions already indicated. Following up this idea, M. Cottancin has formulated a complete theory to account for the great primary rifts in the crust of the terrestrial globe; and this theory, he claims, may be applied for tracing the position of metalliferous fissures as well as for indicating the circulation of water in all parts of the world.

To illustrate the applicability of his theory to the geological basin of London, the author has drawn lines, following the directions north-east to south-west, and north-west to south-east, upon a geological map, which shows the circulation of water throughout the area in question. On this map may be observed a series of descending fissures, which the reader may follow by the aid of the accompanying diagram, which was traced from the map, after the addition of the diagonal lines in the directions previously indicated. One fissure proceeds from Clapton, between the 10th and 20th minutes of the 1st degree east of London, as far as Chandry; another, in the direction south-east to north-west, passing by Sproughton, and entering the chalk near Flowton. A little to the east of the line passing by Ipswich is one going by Bucklesham, Pritry, Copdock, Higham, Wormingford, Pebmarsh, Gosfield, Shafford Pond, and finally entering the chalk at Great Bardfield. To the east of this last line is one passing by Alferton, Shetley, Bradfield, Lawford, Mile End, Lexden, Coggeshall, Braintree, Fourth End, Bacon End, High Wick, and thence to the chalk at Stanstead. A step more to the east we have a line running by Harwich, Beaumont-cum-Mose, Frating, Fringringhoe, Great Birch, Rivenhall Place, Pleshey, Willingale Spain, High Laver, Epping, Wormley, Gough's Oak, Ridge, Bushey, and



terminating near Rickmansworth. A step farther to the east is a line by Kirby-le-Soken, Little Clacton, the River Colne, West Mersea, Tolleshunt d'Arcy, Great Totham, Danbury, Chelmsford, Frierning, Chipping Ongar, Theydon Bois, Upper Edmonton, Southgate, Totteridge, Uxbridge, Hedgerley, finally losing itself in the chalk near Cookham. Another step to the east is a line passing by the Blackwater River and Snoreham, Burleigh, East Hanningfield, Buttsbury, Brentwood, Haveringate Bower, Barking Side, Leytonstone, and thence by Regent's Park to the River Thames.

As the basin here suggested as being available for the supply of London is delimited by a line through Ipswich to the east, and through Hertford to the west, we have an area measuring 60 miles by 30 miles, equal to 1800 square miles, or 1,152,000 acres. The average rainfall in the London basin is about 24 inches per annum. Reducing acres to square feet, and taking the rainfall in feet, we have $43{,}560 \times 2 \div 365 = 238{\cdot}69$ cubic feet, or about 1500 gallons, per day per acre. Hence, deducting one-third for loss by evaporation and for surface water not entering the soil, the quantity to be found in the circulation lines and per acre of the collecting area for these great underground conduits should be 1000 gallons per day; and the total quantity of water available per day in the entire basin would be $1{,}152{,}000 \times 1000 = 1{,}152{,}000{,}000$ gallons. M. Cottancin acknowledges that the whole of this quantity could not be secured; but he thinks it is easy to see that the supply of London with water of excellent quality might be amply assured by the adoption of measures for the collection, conveyance, and storage of the immense supplies existing along the lines of flow indicated.

Retiring Members of Parliament.—In a list published of Conservative and Unionist members who, so far as is known, retire, at the end of the present Parliament, from the constituencies they represent, we notice the following names with which our readers are familiar: Sir John Aird, Sir William Arrol, Sir J. E. Dorington, Sir W. Houldsworth, and Mr. H. Worsley-Taylor, K.C.

The Public Lighting of New York.—The agitation on this subject, to which reference has recently been made in our columns, is still being kept up. We learn from the "Municipal Journal and Engineer" that the Mayor (Mr. M'Clellan) has secured the unanimous adoption of the following resolution by the Board of Estimates: "That the Corporation Counsel be requested to furnish to this Board, as promptly as possible, his opinion whether there is power in this city, under its present Charter, to construct and maintain plant for furnishing electric lighting to the public buildings and streets of the city." This action may lead to the establishment of municipal lighting plant; and it appears that steps have already been taken to introduce the necessary Bill at Albany to authorize it.

Motive Power for Electricity Works in Germany.—The "Elektrotechnische Zeitschrift" for the 12th inst. contains the tenth annual compilation of statistics in regard to works for the generation of electricity in Germany, brought up to April of last year. Only central power stations and works from which light and power are supplied to the public are comprised in the tables, which furnish the following particulars as to the power employed: Of the 1028 works, the primary power was exclusively steam in 570, aggregating 341,248 kilowatts; water in 109, aggregating 14,547 kilowatts; gas in 90, of 10,050 kilowatts; Diesel gas-engines in two plants, of 295 kilowatts; and wind in one plant, of 220 kilowatts. Combined water and steam power were used in 208 works, water and gas in 16, steam and gas in 10, water and benzine-motors in 4, and electricity (from another station) and steam in 3.

SCRAPING WATER-MAINS IN MELBOURNE.

The subject of the scraping of water-mains for the removal of incrustations has been dealt with from time to time in our columns; and it has been specially brought under the notice of members of the British Association of Water-Works Engineers by papers submitted at their meetings. It may therefore be useful to reproduce, at the present juncture, some particulars in regard to work of this kind carried out at Melbourne by Mr. Edgar G. Ritchie, as furnished by him in a paper presented to the Institution of Civil Engineers, and recently published by them.

The hand scraper used consists simply of a short hollow steel cylinder, slightly less in diameter than the pipe to be operated on, and having its anterior rim sharpened to a cutting-edge. The rods used are ordinary $\frac{1}{2}$ inch or $\frac{3}{4}$ inch gas-piping. As examples of the average outlay on scraping by hand labour in the Melbourne water supply, the cost for $51\frac{1}{2}$ miles of 3 to 9 inch pipes, in densely-populated districts, was 1d. per foot, and for 15 miles of 3 to 5 inch pipes, under favourable circumstances, rather less. The costs include cleaning cross-connections, bends, hydrants, &c., providing all material which has to be replaced or used for repairs necessitated during the operation, and clearing house services that are blocked.

The automatic machine adopted in Melbourne is the "Bilton" scraper. It consists of two pistons, each carrying tumbling cutters, which support and take the wear off the piston discs, which retain the water and thus secure the necessary pressure to drive the machine. The latter, by reason of this arrangement, is so short as to be capable of passing ordinary obstructions, of going round bends, and of being inserted in, and withdrawn from, a very short opening in the pipes. Immediately behind the cutters are discs of best English leather or rubber insertion cloth. Next to these are red rubber discs, which are held by a metal washer and adjusting lock-nuts on the spindle. The discs and red rubber allow the cutters to be depressed when an obstruction, such as a ferrule, is met witb, and, in the front piston, act as a cushion to force them back again to the full diameter of the pipe; the pressure of the water fulfilling this service in the back piston. By means of the adjusting nuts, the cutters may be slackened or stiffened in order to deal with pipes of slightly different diameters. Further, it is often necessary, where the incrustation is heavy or of a hard nature, to remove it in two or three scrapings, screwing up the cutters by means of the adjusting nuts, after each operation, until the pipe has been cleared out to the full diameter.

The movement of the machine through the pipe is practically without rotation. The cutters cling to the internal surface of the pipe, and remove the incrustation in a far more complete manner than a hand-scraper, which has to be of slightly smaller diameter than the pipe in which it works. Further, the result is attained without damage to the coating, which remains intact with the marks of the cutters just visible on it. The action of the cutter may best be described by stating that the work of the front piston results in the incrustation being "ploughed up" as by a ploughshare, while the function of the back piston is to grind up and remove what is left. The water under pressure escapes in a fine stream at high velocity around the circumference of the discs, and, playing immediately upon the cutting-edges, flushes the deposit away ahead of the machine to hydrants, scours, or other openings.

The speed of working the machines should not exceed four miles an hour, depending upon the amount of incrustation in the pipes; and the best result is obtained by limiting the speed to two miles an hour. In the larger sizes, with a good pressure,

a very small opening of the regulating valve is sufficient. The slow speed not only allows the scraper time to do its work and prevents it becoming choked with sediment, but also enables the foreman in charge to accompany it on foot and note its progress.

In removing incrustation by means of an automatic machine, two cuts in the pipe-line are required—one for the insertion and the other for the withdrawal of the scraper. In reticulation pipes, where the length to be cleaned between two cross-mains is less than 12 to 14 chains, or less than 7 chains in a pipe supplied from one end only, the hand-scraper is used; and thus, in densely populated districts, automatic and hand-scraping must always proceed concurrently. The first step is to shut the stop-taps of the house services, having previously given notice to the consumers from house to house—a course which is considered necessary in Melbourne, but one which adds very much to the cost of the work. The valve is then opened sufficiently to drive the scraper at the speed desired.

All hydrants and scour-valves in advance of the scraper are opened, and each of these is closed as soon as the machine has passed. At the hydrants, the passing of the machine is indicated by a sudden increase in the flow, and at the same time a comparative clearing of the discharged water. The shorter the distance apart of the appliances for getting rid of the discharge, the more rapidly and economically can the operation be conducted. In small pipes it is necessary to have these every few chains, especially where there is much incrustation.

Should the machine be stopped by the accumulation of sediment in front of it, the usual remedy is to cut the pipe in front of the machine and to clean up to it with the hand-scraper. Often, however, relief may be obtained without cutting the pipe, by shutting off the pressure behind, and turning it on in front of, the machine; thus scouring out, partly by suction, the material causing the stoppage. A house-connection ferrule may occasionally be found to project so far into the main as to stop the machine, in which case by unscrewing the ferrule the machine may be allowed to pass. Often in such cases the machine may be "bumped" past the ferrule by shutting off the pressure and turning it on again suddenly. The presence of foreign material in the pipe, such as stones, lead from a joint, &c., is often the cause of a stoppage for which the only remedy may be to cut out the piece of pipe.

The whole course of the scraper can be accurately followed by attaching to it a piece or ordinary fishing-line, arranged to operate a recording drum at the starting-point. This expedient has been very successfully employed, especially on long lengths where there are not many hydrants; but in an ordinary town distribution system the men become quite independent of the fishing-line, being able to locate the machine very closely by sounding or by observing the flow from the hydrants. For convenience in the insertion and removal of the scrapers, permanent hatch-boxes were adopted in the Melbourne system. When an existing main is cut for scraping, the only new part required in making good the pipe, except an occasional plain or socket-piece of new pipe, is this combined thimble and hatch-box. The piece of pipe removed at one cut is generally used to make good the next cut, and so on.

A CONCRETE-STEEL WATER-TOWER.

Our American contemporary the "Engineering Record" recently gave the following particulars in regard to an elevated steel tank, supported on a concrete steel tower, forming part of the water-works to be constructed in Bordentown (N.J.). It was included in the plans prepared for the works by Mr. C. C. Vermeule, and presents some interesting features. The tower is to be 100 feet in height, from the top of the footing course of the foundation to the floor on which the tank is to stand, and will be constructed entirely of reinforced concrete. Eight columns, spaced equally round the circumference of a circle, and a hollow concrete-steel cylinder, having an interior diameter of 4 feet, built concentrically with the circle on which the columns are spaced and joined to them by three balconies, will form the tower. These balconies are 33 ft. 4 in. apart, and apparently divide the tower into three sections, though it is intended to build the structure, as nearly as it is possible to do so, as a monolith.

The concrete foundation is a 16-side polygon 6 feet thick, 38 feet in diameter at the bottom, and 32 feet at the top; the sides having two steps which provide the reduction in diameter. The vertical reinforcement rods of the eight columns will extend into the foundation about 2 feet. A spiral steel-frame stairway with cast-iron treads, built around the central cylinder, and supported by the floor of the balconies, will provide a means of reaching the tank. The columns are placed outside this stairway. In the first section of the tower from the foundation to the first balcony, the wall of the central cylinder is 18 inches thick, reinforced by vertical bars $\frac{7}{8}$-inch square, spaced 10 inches centre to centre, and $\frac{1}{4}$-inch horizontal tie-rods, spaced 12 inches around the outside of the vertical bars. The columns are 3 ft. 6 in. square in section for the first 33 ft. 4 in. of their height, and are equally spaced around the circumference of a 26 ft. 6 in. circle. They are reinforced by a vertical bar $1\frac{7}{8}$ inches square near each corner, and by horizontal tie-rods $\frac{1}{4}$ inch in diameter, spaced 12 inches outside the vertical bars.

The floor of the first balcony is to be of concrete, 1 foot thick, reinforced with bars $\frac{1}{2}$ inch square, radiating from the centre, and spaced 12 inches apart at a distance of 13 feet from the centre. In addition to these bars, two $\frac{1}{2}$-inch square bars are placed across the floor between two columns, to provide support at the stairway opening. A beam round the outer edge of the balcony, 1 ft. by 2 ft. in section, and reinforced by two bars 1 inch square, supports the balustrade round the balcony and a portion of the load that comes on the floor. This balustrade is 6 inches thick and 3 feet high, reinforced by horizontal bars $\frac{1}{2}$ inch square and expanded metal, which extends down into the floor of the balcony.

Between the first and second balconies, the wall of the central cylinder is 15 inches thick, with $\frac{7}{8}$-inch vertical reinforcement bars spaced 12 inches apart, and $\frac{1}{4}$-inch horizontal rods spaced 12 inches apart around the vertical bars as in the first section. The columns in this portion of the tower are 3 feet square, and are equally spaced around the circumference of a 26-feet circle. Each one is reinforced by four $1\frac{5}{8}$-inch square vertical bars, one near each corner of the column, and by $\frac{1}{4}$-inch horizontal rods spaced 12 inches apart. The interior diameter of the cylinder and the distance of the inside edge of the columns from the centre of the tower is the same throughout; all reductions in dimensions along the radial lines being made on the exterior of both cylinder and columns at the balcony floors.

The second balcony is the same as the first. In the third section, extending from the second to the third balcony, the wall of the central cylinder is 12 inches thick, reinforced as in the second section. The columns in this section are 2 ft. 6 in. square, and are equally spaced round the circumference of a 25 ft. 6 in. circle. They are reinforced by four $1\frac{3}{8}$-inch square vertical bars, one near each corner, and by $\frac{1}{4}$-inch horizontal tie-rods spaced 12 inches from centre to centre.

The third balcony supports the tank, and is a 16-side polygon 18 inches thick. Over the central cylinder the floor of this balcony is reinforced by two rows of 1-inch square rods 12 inches apart, one row at right angles to the other. From the wall of the cylinder to the edge of the floor the reinforcement consists of 1-inch square bars, spaced $5\frac{1}{2}$ inches, at a distance of 12 ft. 9 in. from the centre of the floor. In designing this floor, it was considered that between the cylinder and the line of the columns it would act as a beam fixed at both ends, while beyond the columns the floor would act as a cantilever. An irregularly-shaped beam, 3 feet deep, with a width of 4 feet for a depth of 18 inches, and of 2 feet width for the remainder of the depth, is placed underneath the floor between the columns. Near the lower side of this beam four 1-inch square reinforcement bars are placed. A concrete balustrade, 4 feet high and 6 inches thick, reinforced by $\frac{1}{2}$-inch horizontal bars 12 inches apart, and expanded metal which extends down into the floor of the balcony, is built round the outer edge.

The steel tank, which rests on the top of the tower, is 30 feet in diameter and 40 feet high, with a capacity of about 200,000 gallons. It is to be covered with a light roof of $\frac{7}{8}$-inch lumber sheathing, supported at the centre on four 6-inch square posts placed at the corners of a 6-feet square.

The concrete for the foundation will be made in the proportion of 1 part of portland cement, 3 parts of sand, and 6 parts of broken stone which will pass a $1\frac{1}{2}$-inch mesh screen. The concrete for the tower will be made in the proportion of 1 part of cement, 2 parts of sands, and 4 parts of broken stone. The interior forms for the cylinder will be made of plain boards; and, though a smooth finish will be given to the interior surface, no effort will be made to make it water-tight. The exterior forms for the cylinder will be of plain staves hooked together, and the exterior surface of the cylinder and all other exterior surfaces will be given a smooth finish.

In the design of the tower, the improved architectual appearance of the finished structure was more considered than the difference in cost between this kind of tower and an ordinary steel tower. However, Mr. Vermeule believes that this structure can be erected at least as cheaply as a steel tower for the same purpose, and will have not only a more pleasing appearance, but will also be more permanent.

THE CONSTRUCTION OF RESERVOIRS.

At the Annual Meeting of the Incorporated Association of Municipal and County Engineers, at Shrewsbury, the following paper was presented by Mr. G. MITCHELL.

STORAGE RESERVOIRS WITH EARTHEN EMBANKMENTS.

Various Types of Construction and their Cost.—This point has been dealt with, since concrete has on more than one occasion recently been declared to be the cheapest type. Owing to the great uncertainty as to the permeability of the natural strata on the water side of the impervious core below ground, and for other reasons, this cannot be designed on rational lines; hence there are numerous types of construction, differing very widely, evolved mostly from the accumulated experiences of various practitioners. It may consist of rubble masonry (a type very little used in this country), cement concrete, lime concrete, clay puddle, or a combination of puddle with concrete or brickwork. When formed of concrete (the concrete, of course, stopping some distance before

the surface is reached), the core is, in the majority of cases, about 6 feet wide till it widens out upwards, either by battering or stepping, to receive the superposed puddle core, and consists of either 5 to 1 cement concrete or 4 to 1 lime concrete with the matrix richer at wet spots. When formed of clay puddle, the core has a surface width equal to from one-fourth to one-third of the depth of water impounded, and reduces downwards rapidly till a minimum width of from 10 to 12 feet is reached, after which it is a parallel. In many cases the puddle rests on a concrete shoe. Another type of puddle core is protected on the sides and bottom by means of concrete. Besides the above main types of construction, there are, of course, numerous minor types.

In considering the costs of the various types, it will be assumed that concrete materials and puddle can be obtained at reasonable prices. Assuming a depth of water in the reservoir of 70 feet, and a depth of trench of 60 feet, the cost per lineal yard of the various types of construction would be approximately as under (the figures being general averages):—

Cement Concrete Type.

	£	s.	d.
Excavations, including pumping, 55 cubic yards, at 6s.	16	10	0
Timbering, allowing for reselling, 160 cubic feet, at 1s. 3d.	10	0	0
Cement concrete (5 to 1), 38 cubic yards, at 16s.	30	8	0
Clay puddle to surface, 17 cubic yards, at 4s. 6d.	3	16	6
Total per lineal yard	60	14	6

Lime Concrete Type.

	£	s.	d.
Cement concrete type, as above	60	14	6
Deduct difference in concrete, 38 cubic yards, at 4s. 6d.	8	11	0
Total per lineal yard	52	3	6

Clay Puddle Type (10-Feet Trench.)

	£	s.	d.
Excavations, including pumping, 73 cubic yards, at 5s.	18	5	0
Timbering, allowing for reselling, 180 cubic feet, at 1s. 3d.	11	5	0
Clay puddle, 73 cubic yards, at 4 . 6d.	16	8	6
Total per lineal yard	45	18	6

Clay Puddle Type, with Concrete Shoe.

	£	s.	d.
Clay puddle type, as above	45	18	6
Extra value of concrete over puddle, 5½ cubic yards, at 12s. 6d.	3	8	9
Total per lineal yard	49	7	3

Combination Type, or Puddle Sandwiched between Concrete.

	£	s.	d.
Excavations, including pumping, 65 cubic yards, at 5s.	16	5	0
Timbering, allowing for reselling, 168 cubic feet, at 1s. 3d.	10	10	0
Concrete (5 to 1), 39 cubic yards, at 17s. 6d.	34	2	6
Clay puddle, 26 cubic yards, at 4s. 6d.	5	17	0
Total per lineal yard	66	14	6

From the above it will be seen that under no ordinary circumstances can the "concrete" type be cheaper than the "puddle" type. There can be little doubt, however, as to the superiority of the former. But numerous failures emphasize the absolute necessity for the employment of the highest qualities of materials, workmanship, and supervision in its construction; and in the case of direct labour, the supervision should be more efficient than if the work were contracted for. Unless the above conditions can be absolutely guaranteed, clay puddle forms by far the safest filling for the trench.

The enormous depths to which some reservoir trenches have recently been sunk, and the element of uncertainty as to their efficiency even after these great depths have been reached, especially in twisted strata, have led the author to consider whether the reservoirs could not have been constructed more economically and efficiently by methods not involving trench sinking. Several such cases have been investigated following the method adopted in tightening the Randymere reservoir, Whitby; and the author found that, after making large allowances for contingencies, this method of construction came out much cheaper than any other. The following are some of the advantages possessed by the method: (1) The embankments do not require any fine selected material—in fact, the stonier they are the better, and therefore are very cheap to construct; moreover, as the inner slope is not saturated with water, the section of the embankments can be much reduced. (2) The reservoir is much cleaner, and there is no trouble with vegetation on the banks; shallow parts at the upper end can be readily cut off so as to increase the average depth. (3) Reservoirs could be constructed irrespective of the geological strata. Thus many favourable sites for reservoirs could be utilized where it would be hopeless to attempt to make reservoirs in the ordinary way.

In too many cases the location of reservoir embankments is determined entirely from surface indications; the underlying strata being guessed at from the small portions of comminuted strata withdrawn from boreholes of small diameter, and the engineer trusting to luck to find a decent bottom at a reasonable depth. Trial shaft sinking, by which alone a sound judgment can be made, is frequently postponed till the water authority is committed to a contract; and as a fresh site means a fresh Act of Parliament, the site is adhered to, no matter what the final cost of the structure may be. The author believes in such cases the above method of construction will well repay investigation.

Position of the Valve-Shaft.—The valve-shaft is frequently built almost entirely exposed; but for economy, with equal efficiency, it should undoubtedly be placed wholly in the solid ground, for the following among other reasons: If exposed, it means that the shaft is usually an ornamental octagonal tower of masonry, and in order to secure water-tightness under the extremes of temperature, the shaft must be lined with cast-iron cylinders; a long foot-bridge is also necessary as an approach. There have also been cases of the valve-tower being injured by movement of the earthwork of the embankment. All the above contribute to render an exposed valve-shaft very expensive; and it possesses no advantage whatever over a shaft built entirely in the solid. The valve-shaft should be placed immediately on the water side of the impervious core of the embankment. A little scheming will generally determine suitable positions for the various draw-off pipes, without much disturbance of the natural strata.

The great variation in the top width of the puddle walls calls for comment. The top width in many of the older reservoirs was only 4 feet; while during the past ten years in deep reservoirs, where first-class puddle and backing have been used, the top width has varied from 6 to 14 feet—the latter being surely very extravagant. The amount of cover given to the puddle wall is also most important. In many large reservoirs it is as small as 14 inches, which is far too small, considering the great danger of the puddle wall cracking, and the comparatively trifling expense of adding a foot or two to the height of the embankment.

So great is the danger should a drought be succeeded by a very heavy flood, as happened in the North of England a few years ago, that the author believes it would be worth while to have a pipe laid across every important embankment, so that the roadway might be kept moist in dry weather, and the top of the puddle wall in good condition. The cost of this in most cases would be infinitesimal, as springs can be caught on the higher ground near most embankments. The same idea could be applied to masonry dams where severe stresses are developed in the masonry by changes of temperature. A stream of water could be kept flowing continually over all exposed masonry. The water thus flowing out of the reservoir would not be wasted, as it would form part of the compensation water.

Within the last nine years, there have been constructed three reservoirs at the terminations of three of the largest aqueducts of this country; the capacities varying from 700 to 120 million gallons. The types of construction are: (1) Earthen reservoir, with a puddle wall, lined on embankments only; (2) concrete reservoir, with vertical retaining walls and brick and asphalte lining; (3) earthen reservoir, with puddle wall, completely lined with concrete and pitching. Considering that all three walls are practically identical in character, in seems strange, in view of the enormous economies possible by the adoption of the first type, that the other two types should have been used, particularly the second; the author not being aware that there is any advantage in vertical walls. Doubtless "circumstances alter cases;" but there is a limit to the application of even this truism.

Till recently the author was led to believe that the advantage of numerous decanting-pipes in deep reservoirs was universally admitted; but having occasion to visit a deep reservoir under construction, he found that the whole of the water was intended to be withdrawn from near the bottom.

Service Reservoirs.

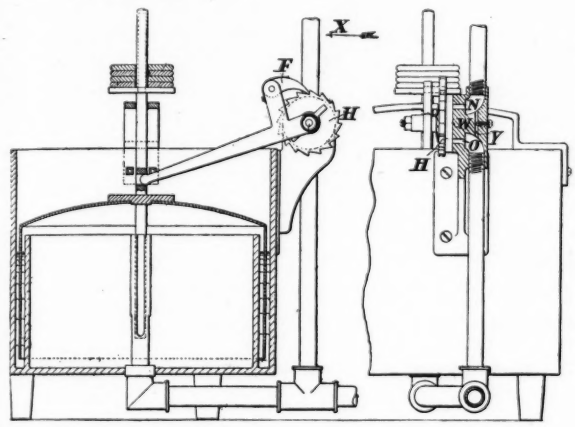
Circulation of the Water.—Too little attention seems to be given to the prevention of stagnation of the water in service reservoirs in this country. On the other hand, some foreign engineers appear to have gone to the other extreme, In some cases, for the sole object of cramming all the valves together, the inlet and outlet pipes are within a few inches of each other, with the result that there is no chance of circulation. Considering the small extra expense involved, these pipes should be so arranged that there is as much circulation as possible. The inlet-pipe should discharge well below the surface, and if there are several inlets and outlets they should be spaced well apart and at various levels. Floating outlets are sometimes used in covered service reservoirs; but the author believes that, generally speaking, these are a mistake. Very often the water entering a covered reservoir is slightly warmer than that in the reservoir, owing to its passage through a surface condenser or exposure to the air, and hence has an inclination to rise to the surface. The result is that if a floating outlet is used the incoming water is skimmed off without mixing with the rest. Generally speaking, unless there is a great deal of suspended matter, floating outlets should not be employed, as most service reservoirs are sufficiently shallow to preclude the possibility of the upper part of the water being superior in clearness to the lower part in any perceptible degree.

Ventilation of Reservoirs.—The author believes that in many cases too much ventilation has been provided for covered reservoirs, as there is the chance of objectionable matter being introduced through the ventilators. To guard against this, it has been proposed to put into them some filtering material for the air. Generally speaking, the capacity of service reservoirs is such that, with even the maximum rate of inflow, the water-level rises slowly and forces the air very gently through the ventilators, and there is exceedingly little risk of any dangerous uplifting effect on the roof. It hence seems rather absurd to see, as sometimes seen, as many as thirty ventilators on a small reservoir.

REGISTER OF PATENTS.

Automatically Controlling Gas-Jets.—Meunier, S., of Stockport, and Anderson, J., of Edinburgh. No. 28,668; Dec. 30, 1903.

This "means for effecting the automatic lighting or extinguishing simultaneously of a number of gas-jets or groups of gas-jets when desired," is intended to enable "the automatic lighting and extinguishing of the jets to be effected reliably notwithstanding the variations of gas pressure from point to point in a hilly district." The apparatus specified comprises a liquid sealed gasholder adapted to be raised and lowered by a momentary increase and decrease of pressure in the supply mains, whereby a step by-step valve is directly operated so as to start or stop the supply of gas to the burner, as desired—regulation to suit varying pressures from point to point being effected by suitably loading the individual holders.



The illustration shows a section through one form of apparatus, and a (partly) sectional elevation looking in the direction of the arrow X.

When a number of gas-lamps are situated at various points in a district, and, in consequence, receiving gas at various pressures, each lamp to be lighted and extinguished is provided with a miniature gasholder loaded by means of weights. The amount of weight carried is proportioned to each lamp according to position; so that when a predetermined pressure is momentarily turned on at a certain part in the district, all the holders will be raised practically simultaneously and the lamps lighted. The bells are made of sufficient capacity—say, 4 or 5 inches diameter for ordinary street-lamps—so as to ensure certainty of action.

When the bell rises under the action of the momentary abnormal pressure in the mains, it carries with it a bell crank lever carrying a pawl F, which engages with teeth on the periphery of a step-by-step disc-valve H. The disc is resiliently held against a smooth valve face W by a spring. The valve face is provided with passages N and O for the gas supply to and from the apparatus. A small bye-pass passage Y maintains a pilot light constantly at the burner.

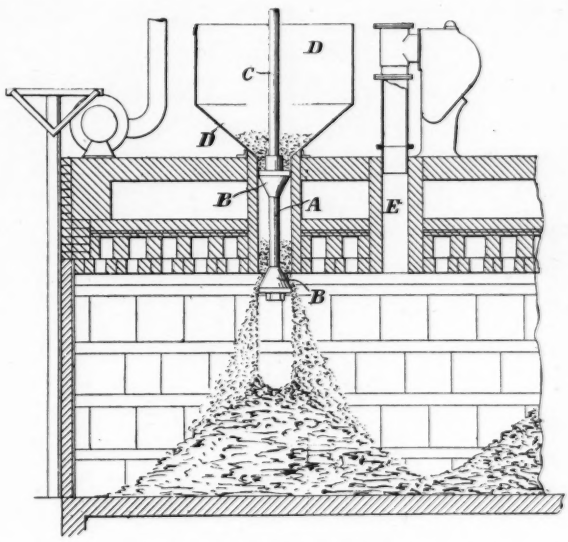
In the valve there are an even number of grooves radiating from an annular groove; the radial grooves being arranged diametrically opposite, so that when one groove is registering with the gas supply N from the main the diametrically opposite groove is registering with the supply passage O to the burner.

The operation of the device is as follows: When a momentary abnormal pressure is turned on, gas passes to the interior of the bell; and if the valve H is in the closed position—that is, if two of the grooves are out of register with the gas-supply pipes—the motion of the bell, consequent on the momentary pressure inside, will cause the pawl F to move the disc H one tooth forward. Then, since the teeth in the ratchet are half the angular pitch of the grooves, these latter will be brought to register with the openings N and O to the supply pipes respectively. There is thus a clear passage from one supply pipe to the other pipe and burner; and the gas flows through to be ignited by the pilot flame in the usual manner. The next momentary impulse will effect the extinguishing of all the lamps by moving the step-by-step valve round through the pitch of another tooth.

Making Coke, &c.—Settle, T., and Padfield, W. A., of Exeter. No. 4708; Feb. 26, 1904.

In order to obtain a denser quality of coke and coke of variable density from coke-ovens, the patentees propose to feed the coal to the ovens in small quantities and at short intervals, so that it will fall more or less lightly, and thus permit of the density being regulated.

In the illustration is shown (in longitudinal section) a portion of a coke-oven modified for the purpose of this invention. The oven shown is one of a well-known type provided with a door, a feeding passage, a gas ascension pipe, with a hydraulic or equivalent main, &c. A is the feeding passage to which a measuring and charging device is applied. The passage is of the same diameter through its whole length; and in it is placed a vertically reciprocating device which is continuously operated in any convenient manner. The device may consist of two conical plungers B mounted on the same rod C at a distance apart, regulated according to requirements by shifting the top plunger on the rod. At the top, the feeding passage is provided with a hopper D to receive coal, and through which the rod C works. The coal from the charging device falls somewhat as indicated—that is to say, it gradually builds up "a series of piles of incandescent material with thin layers of uncoked coal on their sloping sides and having a small crater at the



apex in which the tar will be largely distilled, leaving only the carbon to assist in the production of the coke."

The large quantity of good gas formed "will pass off by the ascension pipes E with certain liquid products, to be subsequently operated upon in any convenient manner." The coal cokes rapidly as it falls into the ovens, and so "the time for coking a charge will be somewhat reduced, while the operation of coking will commence with the commencement of the feed and gradually continue as the charging continues."

Extracting Tar and other Impurities from Illuminating Gas.—Everitt, W., of Ilkley, and Redman, T., of Bradford. No. 1826; Jan. 25, 1904.

This invention relates to the abstraction of impurities from crude gas by a combination of mechanical parts so arranged that fine particles of tar and other impurities combined therewith and floating in the crude gas are extracted by a series of movable collectors placed within a casing and so retained that the collecting mediums, held at a distance from each other, are capable of being withdrawn for examination, and it is possible "to vary the velocity at which the current of crude gas is caused to flow against and through the collectors for extracting the impurities and keeping the apparatus in a working condition, the velocity at short intervals being higher than at other short periods of time, in contradistinction to the crude gas being allowed to flow at its normal or undisturbed rate through the apparatus, and by these means to enable the tar and combined impurities deposited on the collectors to be to a great extent, if not entirely, cleared of such deposit automatically without having to remove the collectors from the casing."

Fig. 1 (p. 236) is an elevation of the apparatus. Fig. 2 is a plan. Fig. 3 is a cross section of the tar-screen. Fig. 4 is an elevation of a valve-seating flange (drawn to a larger scale) showing the perforations through the flange. Fig. 5 is a similar view with the swing-valve in position, covering some of the perforations, one of which is clear of the swing-valve and always uncovered. Fig. 6 is a plan of a valveless cylinder or pump suitable for carrying out the invention.

The tar-extracting apparatus may be fixed in any convenient position between the foul-main range of pipes and the purifiers. The inlet branch A is connected to the foul-main range; a stop-valve of the ordinary construction intervening. The outlet branch B is connected to the condensing stack. A stop-valve in this case also intervenes, so that (for examination) the apparatus may be entirely disconnected, in which case the crude gas would be conducted direct from the foul main to the condenser, as usual; suitable valves being introduced for the purpose of forming a bye-pass of the ordinary type.

Within the chamber C a number of disc rings or plates are inserted; the centre opening through each plate being filled by a perforated screen of finely meshed wire gauze, through which the crude gas is made to flow at irregular velocities in the direction toward the outlet branch. At intervals, however, gas is extracted from the apparatus by a valveless cylinder or pump of suitable capacity, and, when reinjected, is made to flow through the screens during a short interval of time at a high velocity; while at alternate periods gas is extracted from another portion of the apparatus, which, when reinjected, is made to flow at a high velocity and impinge on the opposite sides of the screens—the gas finally escaping at B.

At each end of the apparatus is a branch D, communicating with the interior. These branches are connected together by a pipe E, provided with a branch connected to one end of a cylinder, like that of an ordinary steam-engine, but without any valve; so that an open thoroughfare through the pipe is maintained between the branches D and one end of cylinder, which is provided with a reciprocating piston of similar construction to that of a steam-engine.

In fig. 6 is shown such a valveless cylinder. The crank shaft may be rotated in any convenient manner—such as by a strap travelling around in tight contact with a pulley secured on the shaft, thereby causing the piston to reciprocate in the cylinder. The branch F at one end of the cylinder is connected to a branch C by a pipe through which there is an open passage without any valve; the branch H at the opposite end of the cylinder being connected by a similar pipe to the branch I, so that each side of the piston, on reciprocation, extracts gas from, and reinjects it into the interior of, the apparatus from which it is extracted.

The centre compartment J of the apparatus is connected by the

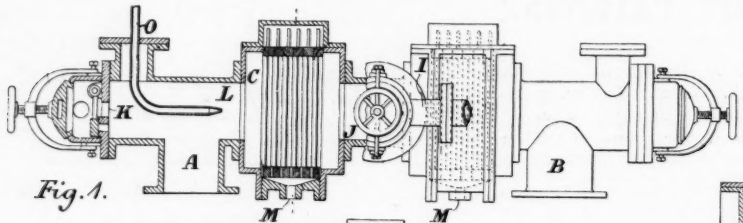


Fig. 1.

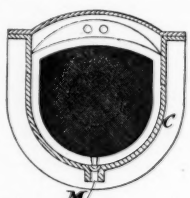


Fig. 3.

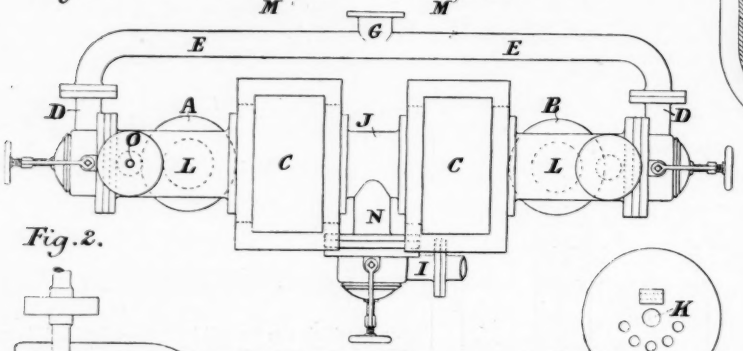


Fig. 2.

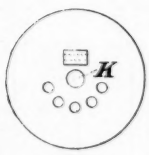


Fig. 4.

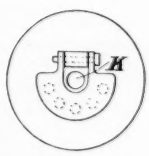


Fig. 5.

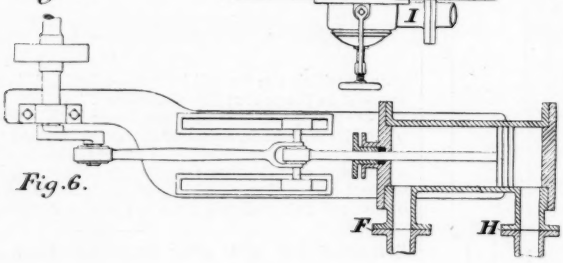


Fig. 6.

branch I to the opposite end of the valveless cylinder by a pipe through which there is an open passage without a valve; so that, on the reciprocation of the piston, gas is alternately extracted from the ends through branches D, and from the centre of the apparatus through a branch I, and forced back into the respective cavities or compartments through an opening K in each valve plate, at a high velocity and pressure, for the purpose already described.

In the interior, near to each branch D, is a valve plate through which perforations are formed. These are covered with a valve plate swinging on a pin, so that, on the reciprocating piston receding from one end of the cylinder, gas is drawn from the cavities L (one at each end of the apparatus) through the perforations. The valve swinging from its seat allows gas to be freely extracted from the respective cavities; and on the return stroke of the piston each valve plate is pressed against its seat, as shown, and, by the piston moving on its return at the same rate, the gas is forced back into the apparatus—the whole volume passing through the respective perforations at a high velocity into the cavities L, against and through the wire gauze screens—thus agitating the other gas in the cavities, and causing it to impinge with force against, and to pass through, the screens. This minutely splits up the current, causing the tar and the like to be deposited on the walls of the screens and casing, from which it drains away, through openings M, to the store tanks by sealed drain pipes of ordinary construction.

When the gas is made to flow through screens in one direction only at a speed suitable for depositing tar and the like thereon, experience has shown (say the patentees) that the fine openings through the screens are soon filled up with tar and other impurities—rendering the apparatus inoperative. In order to keep the screens workably clear of deposit, they connect to the branch pipe N, placed near the centre of the apparatus, a valve plate and swing valve, enclosed by a similar cover, provided with a branch I, connected, as before described, by a valveless pipe to the opposite end of cylinder to that of the branches D. Thus, when the piston is moving in one direction, gas is drawn into the cylinder from the centre compartment J, at a time when the opposite side of the piston is forcing gas into the cavities L, against and through the screens towards the centre compartment J. This action is repeated alternately—that is to say, gas is passed rapidly through the screens N first in one direction, then in the other.

The piston, after extracting gas from the compartment J, on the return movement forces it back into the compartment and through the screens to the right and left of the branch N. Thus, by these pulsations of current, the gas is agitated, and what may be termed "resived"—that is, made to flow through the screens at a varying velocity, some at intermittent intervals in the reverse direction to that of the natural flow towards the outlet branch B. This high velocity of injected gas, in addition to agitating that within the apparatus, has the effect (it is said) of removing from the screens any tar or other impurities deposited thereon by blowing it into the spaces between the screens. The tar, dropping therefrom to the bottom, escapes to an opening M at the bottom of each casing.

As a further precaution against the liability of the openings through the screens becoming filled up with collected impurities, and thus rendering the apparatus inoperative, it may at times be essential that steam or other fluid under pressure be injected into the apparatus. This may be accomplished by a pipe O, placed, by preference, at the inflowing end (as shown), and conducted internally towards the centre of the apparatus. The pipe is provided with a stop-tap, and on opening it steam is injected within the casing for a short period for the purpose of damping and assisting to clear the deposit from the fine openings through screens.

Gas-Purifiers.—Boult, A. J.; a communication from La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gàz, of Paris. No. 22,815; Oct. 22, 1904.

This invention relating to purifying apparatus is chiefly characterized by the fact that the purifying mass is arranged in layers, having an inclination approaching that of the natural slope which would be formed by a heap of material in grain or in powder. Thus, for instance, iron oxide placed in heaps forms inclined surfaces, the angle of which with the horizontal depends on the greater or lesser degree of humidity. In a very dry purifying mass, the angle varies between 29° and 32°; but in a wet purifying mass (such as is generally used in purifiers), the angle varies between 33° and 38°.

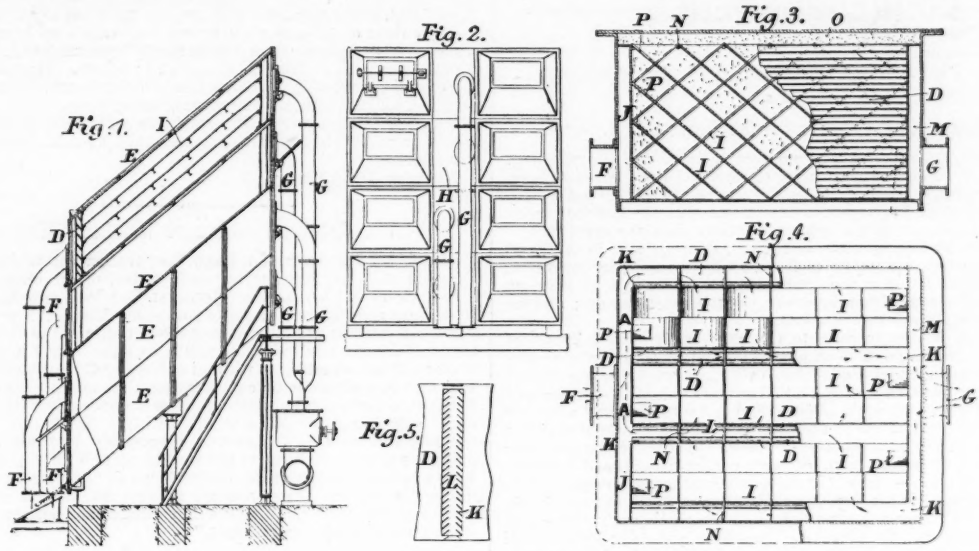
For example, if on a board forming an angle of 38° with the horizontal is placed a uniform layer of wet purifying material, the mass will not have the tendency to slide down; but, on the other hand, the mass next the board will not receive any pressure from the upper mass, but will alone be subject to pressure (very weak) produced by the weight of the material above. If, now, several boards are placed one behind another in parallel oblique direction, and the spaces between the boards are filled with purifying material, the angle could be even slightly greater than 38° (reaching about 40°) without the mass acquiring the tendency to slide.

This is the principle underlying the construction of purifiers without grids according to this invention. The gas passes through the layers of purifying material in a direction at right angles to the lateral planes of the inclined layers. Moreover, in a purifier of this kind, the main current of gas is divided into a number of secondary or smaller currents, each of which passes through a portion of the purifying mass.

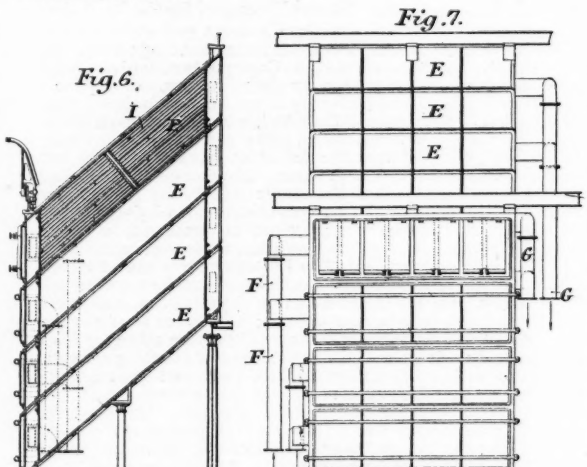
In figs. 1 and 2 (p. 237), the purifiers E are at an angle of 40°; their inner boards I being arranged parallel to each other and at the same slope. Inclined plates D, arranged in the shape of louvres, stop the purifying mass at a certain distance from the front wall of the purifier. This arrangement enables the filling to be done from the top or back, and the discharging at the bottom or front. The gas arriving through the pipes F is evenly distributed throughout a chamber H, which is common to two purifiers arranged side by side. From this chamber, the gas passes through the purifiers in a direction at right angles to the inlet chamber, and escapes through the pipes G.

Fig. 3, in longitudinal section, fig. 4 in horizontal section, and fig. 5 in cross-section on the line A—A of fig. 4, show the same construction of purifier arranged in an ordinary purifier with sieves or grids. In this construction, the inlet branch F communicates with a box or pocket J constituting an ordinary purifier. The purifying material is placed on boards I arranged at an angle of 40° one above another, and in sets of two adjoining elements inclined in opposite direction—two consecutive sets being divided from each other by an empty space L not filled with purifying material and affording a passage for the gas. Purifying material introduced from the top between the boards I cannot descend into the passages L owing to the provision of plates D (also inclined at an angle of 40°) in the direction of the retention of the material, and arranged at a certain distance apart for the free passage of the gas. The gas enters the box or pocket J, passes through vertical slots K made in the wall and corresponding to the passages L, and enters through the louvre-shaped passages and spreads out horizontally at each side in the purifying mass held by the boards I. At the side opposite to that of the inlet box or pocket J is provided an outlet box or chamber M, the wall of which is also provided with vertical slots K corresponding to the passages L.

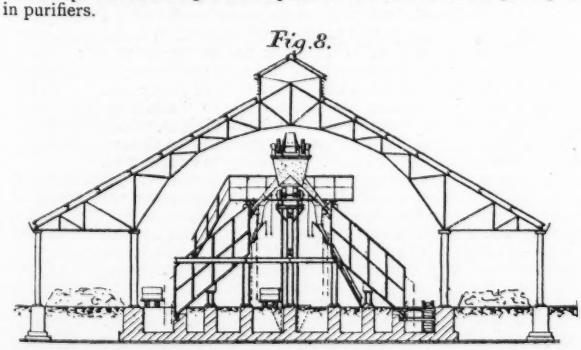
The boards may be of wood or plates of armed concrete or any other



material, arranged at an angle of 40° with the horizontal. They rest at their bottom edges on the bottom of the purifier and laterally on flanges cast in one piece with the lateral plates or walls of the apparatus, or on angle irons. At the top they rest on bars of a grate N connecting the two opposite sides of the purifier. The whole of the plates and the louvres are, moreover, covered with a layer of purifying material O, of sufficient thickness to prevent, in the upper portion of the purifier, the gas from following the shortest path between the inlet and outlet louvres.



As the bottom compartments formed by the boards I cannot be filled with purifying material in the same manner as the upper boards, the outermost boards are provided with an opening P through which the purifying material is introduced. The distribution of the admission and escape currents of gas corresponds to the method usually adopted in purifiers.



The characteristic feature of the purifier according to this invention consists, therefore, in the use, instead of a large number of laths, of simply a small number of boards placed at an angle. It follows from the special arrangement of this new purifier, says the patentee, with inclined boards that the speed of the gas is reduced, and that the working is improved owing to the divided current system. The mass is everywhere equally compact, so that resistance to the passage of the gas is everywhere the same. The purifier without grids is said to have all the advantages of ordinary purifiers and also the following additional advantages: (1) Instead of a considerable quantity of very fragile laths or grids, a small number of solid boards or plates is used, the wear of which is practically *nil*. (2) The space taken up by the boards is considerably smaller than that occupied by the laths with their attachments; so that more space remains available for the purifying mass. (3) The building of such a purifier, without grids or sieves, is simpler and cheaper.

The system of purifiers with series of inclined boards limited by passages with louvre-shaped walls can also be adopted for a new installation of purifier rooms or compartments, with vessels arranged at an angle of 40°, as shown in figs. 6 and 7. In this arrangement, the introduction of the material is effected, as in the arrangement shown in figs. 1 and 2, from the top, and the drawing off at the bottom; the cover or top of each purifier thus remaining closed. The construction shown in figs. 1 and 2, and 6 and 7, enable a number of purifiers to be superposed in such manner that, the bottom of one forming the cover for the one below, the space occupied by the apparatus is reduced to a minimum, and the surface of the purifying compartment can be utilized to the best advantage.

Fig. 8 shows diagrammatically, in vertical section, a general installation of inclined purifiers with their devices for introducing and discharging the purifying material.

APPLICATIONS FOR LETTERS PATENT.

381.—Pare, W., "Electrically lighting gas-lamps." Jan. 9.
435.—Glasscoe, T. H., "Air gas." Jan. 10.
460.—Baughan, W. H., "Generating acetylene." Jan. 10.
464.—Symonds, H., "Incandescent burner." Jan. 10.
469.—Davis, H. N., "Combined gas and coal stoves." Jan. 10.
516.—Shoob, I., "Incandescent fittings." Jan. 10.
560.—Butler, E. J., and Green, A., "Gas-stoves." Jan. 11.
563.—Smyth, J., "Generating acetylene." Jan. 11.
564.—Jacob, P. & C., "Gas-igniters." Jan. 11.
566.—Barrière, P., "Gas-generators." Jan. 11.
580.—Bowing, J., "Distillation of coal." Jan. 11.
582.—Bousfield, J. E., "Gas-stoves." A communication from J. Pintsch. Jan. 11.
616.—Deutsche Continental-Gas-Gesellschaft, "Burners for cooking." Jan. 12.
651.—Love, G. R., "Charging retorts." Jan. 12.
654.—Wilton, G., "Holding mantles while the burners are being cleaned." Jan. 12.
676.—Ruscoe, J., and Co., Ltd., and Pass, E., "Ferrules for mains." Jan. 13.
682.—Slater, T. S., "Mantle rod." Jan 13.
736.—Alexander, W., "Dry meters." Jan. 14.
758.—Webster, J. & R., "Purifiers." Jan. 14.
788.—Watkinson, J. G., "Mantle supports." Jan. 14.
798.—Smith, W. B., "Burners." Jan. 14.]

Birmingham and Compensation Water to the Wye.—At the quarterly meeting of the Hereford County Council, Mr. Wallis moved that opposition should be offered to the proposal of the Birmingham Corporation to apply for powers to reduce the amount of daily compensation water from 27 to 20 million gallons. He said no one objected to the abstraction of water at flood times; but the county should take care to see that the mean summer level was not reduced any further. Birmingham, he understood, was prepared to pay £8000 down in order to strike a bargain. For a paltry £8000, or £80,000, or £800,000, it would be criminal to consent to a reduction of 7 million gallons daily, considering the great concession which had been granted to Birmingham in being allowed to tap the sources of the Wye. The London County Council also proposed to make use of a watershed in the same vicinity. After some discussion, the resolution was amended as follows, and agreed to: "That a Committee be appointed to consider the propriety of opposing the proposal of the Birmingham Corporation to apply for powers to reduce the amount of daily compensation water to be discharged into the River Wye from 27 to 20 million gallons, with instructions to give notice of opposition and present a petition against the Bill."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

A Peculiar Feature of the Recent Fog.

SIR,—Referring to the extract from the "Lancet" of the 7th inst., contained in your last issue (p. 157), stating that the bunsen burners used in the "Lancet" office during the recent fog all burned with a yellow flame, instead of the pale blue flame characteristic of the bunsen burner, and which flame on being viewed through the spectroscope showed the distinguishing colour of sodium, the puzzle, it is said, was to show where the sodium came from, as by tests made no sodium chlorides could be found in the air at the time. The explanation seems to us a very simple one from the gas engineer's point of view; and we would make the following suggestions.

Water or water vapour consists (as your readers well know) of hydrogen and oxygen; and when pure water is sprayed or split up (fog or mist), and forced or injected through a bunsen burner, water as such cannot exist at the temperature, and becomes simply hydrogen and oxygen mixed with carbonic acid (or oxide) and nitrogen, and will then burn with a luminous flame in the same way as if ordinary paraffin or kerosene had been injected instead of water. Whenever you get these gases together—viz., hydrogen, oxygen, carbonic acid, and nitrogen ($H_2O + CO + N_5O$)—which occurs when coal gas is consumed in a bunsen burner during a fog, you will get a strong luminous flame. In other words, water vapour (fog) will burn when carburetted and mixed with nitrogen. Sir Oliver Lodge splits up the fog by means of a powerful sparking coil and condenser, and turns it back into water or rain—a costly process. As it is already turned into gas or vapour by Nature, it would be just as sensible to carburet and burn it. A practical demonstration in proof of the above facts can be tested by anyone who cares to spray pure water (which can be either boiled or tested for sodium chloride by the nitrate of silver test before using) into the blue flame of an ordinary boiling-ring, when the water or water spray will burn like oil. The same thing occurs when the domestic kettle boils over on a boiling-ring—viz., hydrogen and oxygen burning in combination with carbonic acid and nitrogen. If there is any sulphur present, as over a coke fire, you get the characteristic odour of sulphuretted hydrogen.

It would seem, from recent trials in the United States Navy with atmospheric oil-burners, that a luminous flame is obtained from an atmospheric burner when steam and a large volume of air are both used for atomizing the oil. If steam alone is used for injecting the oil, you get the blue flame. If compressed air is employed, you get the blue flame. But when steam (water gas uncarburetted), oil (carburetting material), and air (which contains 4-5ths nitrogen) are used, you get perfect combustion with a luminous flame, and no soot. From experiments carried out by us, we have always obtained a bright yellow (sometimes tinged with red) flame when carbon is nitrified (see Berthelot on "Explosives") referred to in the text-books as the cyanogen or ammoniacal flame.

We have made a study of the combustion of gases for years; but all our experiments came to naught while we had to use gas-burners which could not possibly take more than 5 parts of air to 1 part of gas without lighting-back. Some of the burners using this mixture could not be lit at all without having a couple of layers of gauze. To carry our experiments to a successful conclusion, we therefore had to design an atmospheric burner (without gauze) that would use 10 to 15 parts of air to 1 part of gas without lighting-back, irrespective of pressure. The results of our experiments with regard to the combustion of gases and the colouration of flames of atmospheric burners with different mixtures will shortly be sent on to you.

T. D. KELLY and W. J. BILLINGTON,

Southend-on-Sea, Jan. 18, 1905.

The Lewes Water-Gas Patent in Germany.

SIR,—We notice in your last issue a mention of the decision of the Nullity Division of the German Imperial Patent Office, by which patent No. 130,112, April 28, 1900, granted to Professor Vivian B. Lewes, and subsequently acquired by us, has been declared invalid. Will you kindly inform your readers that we have appealed to the Supreme Court; and that, pending its decision, the case is not yet determined.

THE DELLWIK-FLEISCHER WATER GAS SYNDICATE.

Frankfurt a/M., Jan. 19, 1905.

Hydraulic Mains.

SIR,—In reply to Messrs. R. & J. Dempster's letter in your issue of the 17th inst., it is quite true that Messrs. Dempster sent me the drawing referred to, with a letter dated Oct. 22, and which was acknowledged by me on the 24th of the same month, when I pointed out that the arrangement shown in the drawing was, in my opinion, an infringement of my patent. This aspect of the case is personal, and can, of course, be threshed out on its own merits between us. I may say that I have a very high opinion of Messrs. Dempster, and their idea of business conduct, based on a business relationship of about twenty years, which this little affair will not be likely to upset.

The point, however, which I think of general interest—quite apart from the question of the utility or validity of Mr. Beard's patent—is the manner in which engineering firms have to work where patents are concerned, and which is emphasized by the present case. We are all on this earth to do the best we can for ourselves. It seems to me, however, that engineers, when called on to carry out constructional work which is patented, should give some kind of undertaking not to claim any patent in connection with apparatus for similar processes except jointly with the patentee from whom they have obtained the original ideas, or that some such arrangement should be understood. On the other hand, many engineering firms can probably say that more than once in their experience they have spent time and money to assist patentees; and then when success has been achieved, work which should have been theirs has been given to others. This should not be. Clearly, there are obligations on the two sides; and there should not be much difficulty in each party recognizing them.

When a colleague, however, seeks to utilize his fellow's work in whole or part without acknowledgment, the case is different, and my pen fails me.

GEO. HELPS.

Nuneaton, Jan. 18, 1905.

The Catalytic Action of Welsbach Mantles.

The Chief Inspector of a large Corporation gas undertaking (who does not wish his name mentioned) writes, under date of Jan. 20: "In your report in the last 'JOURNAL' of Professor Lewes's recent lecture on the 'Theory of the Incandescent Mantle,' I notice he mentions an experiment to demonstrate the catalytic action of the Welsbach mantle. It may interest your readers to know that I have frequently performed this experiment with an ordinary 'C' burner and chimney. I accidentally observed on one occasion, that on turning on the gas of the incandescent burner two or three seconds after its having been extinguished, and before the mantle had had time to cool below a dull redness, the glow of the mantle perceptibly increased. By nicely adjusting the period between the turning off and turning on of the gas, I have been able to raise the temperature of the mantle so high as to ignite the mixture of gas and air passing from the burner. A very small fraction of a second makes all the difference between success and failure in this simple experiment."

LEGAL INTELLIGENCE.

CHARGES AGAINST A GAS COMPANY'S SECRETARY.

At the Guildhall Police Court, on Monday last week, before Alderman Sir J. Ritchie, George Thomas Verney, of Earl's Court Square, was summoned for having committed corrupt perjury in a series of affidavits sworn to between March and December, 1903; for having on Sept. 10, 1901, when Secretary of the Copiapo Gas Company, Limited, applied to his own use a cheque for £500; further, with having misappropriated various sums of money as trustee for the shareholders of the Company. Mr. Graham-Campbell, who appeared on behalf of the Director of Public Prosecutions, said that the Company was incorporated in 1858, and in 1901 the defendant was appointed Secretary. Later he became voluntary Liquidator. The first charge had reference to the period when he was Secretary; and it was alleged that on Sept. 10, 1901, he applied to his own use the sum of £500. The perjury charged against him was contained in certain affidavits which, under the provisions of the Companies Act, he was compelled to file as Liquidator of the Company. The last charge was one of misappropriating the funds of the Company while a trustee for the shareholders and creditors. On his behalf a sum of £1779 16s. 1d. was paid over to the Liquidator who succeeded him; but, apart from the cheque for £500, the various sums he was alleged to have taken for his own use amounted to £1044 9s. 6d. The Company's banking account was kept at Parr's Bank, Threadneedle Street, and on Sept. 10, 1901, the credit balance was £709 0s. 6d. On that day, a cheque was drawn on the account for £500 in favour of the defendant. This appeared to have been paid into his own private account kept at the same bank. On Sept. 12, at an extraordinary general meeting of the Company, the voluntary winding-up of the concern was resolved upon; the defendant being appointed Liquidator. Counsel having detailed the various items in the manipulation of which the defendant was alleged to have committed fraud as a trustee, said that under the Companies Winding-up Act, 1890, a liquidator had to file an account verified by affidavit. The defendant failed to do this till he received a notification from the Registrar, and when he did there was an omission, among other things, of the payment of dividend on certain 3¼ per cent. Indian Government stock. In the course of his public examination, he admitted that he had made omissions in the accounts intentionally with the object of concealing the balance, and pointed out that when a certain amount was in the hands of the Liquidator he had to pay it into the Bank of England. Had he mentioned these small dividends, it would have called attention to the stock itself. An item of £1007 10s. for coals he admitted to be fictitious; his object being to "tide him over," as he expected to be able to repay it. Mr. E. B. Knight, who defended, said he could not dispute the facts, and suggested that the evidence should be confined to the larger items. The case was adjourned.

The accused was brought up again on Thursday. Mr. Berry, the Official Receiver, stated that there was no suggestion that the defendant, as voluntary Liquidator, had not paid all sums received into the bank. The defendant readily gave him information; but in his own statement of affairs he did not include the sum said to have been due from him to the Company. There was nothing to complain of as to his bankruptcy, and the Court did not make any order to prosecute. Witnesses were called with a view of tracing cheques and Bank notes that had passed through the defendant's hands during the liquidation. Mr. Whinney, a Chartered Accountant, who succeeded the defendant as Liquidator of the Company, stated that the account received showed that a sum of £1779 was due to the Company from him. Mr. Knight again said he did not dispute the statement that the moneys had been used as alleged; but all had since been replaced. The defendant had concealed nothing, and had given every assistance in regard to his own bankruptcy and the winding-up of the Company. No fraudulent intention had been shown, and the defendant had accounted for all the moneys. The defendant was committed for trial on bail in his own recognisances.

MISCELLANEOUS NEWS.

THE FATALITY AT THE BATLEY GAS-WORKS.

Adjourned Inquest and Verdict.

The inquiry into the circumstances attending the deaths of John Francis Bromley, the Gas Engineer and Manager to the Batley Corporation, and George Henry Sandall, a blacksmith's hammerman, who were found dead in a coal-shed at the gas-works on the 13th inst., as recorded in the "JOURNAL" last week, was resumed on Thursday, before Mr. P. P. MAITLAND, the District Coroner. It may be remembered that it was opened on the previous Monday, and adjourned after evidence of identification had been taken. The Town Clerk (Mr. J. H. Craik) represented the Corporation. Mr. J. D. Prior, H. M. Inspector of Factories, and Mr. E. Morley Fletcher, one of the District Inspectors under the Alkali Works Regulation Acts, were present.

Mr. *Arthur Bromley*, the late Manager's son, said the coal-shed in which the bodies were found was about 80 feet long, 20 feet wide, and 20 feet high to the eaves. There was a circular opening about 4 feet in diameter at the dead-end. There were no other openings, except the two doorways at the end at which the accident happened. A short distance from where the bodies were found was a pipe connecting with the purifiers. There was an upright main pipe with two connections, and there were two purifiers—one at the open end and the other at the dead-end of the shed; but on the other side of the wall. There were two branches to the pipe, and a valve to each. A ladder was always reared against the wall, and was used for getting at the top valve or aperture, so that the cap might be taken off to allow the atmosphere to revivify the oxide in the purifier. The covers were off both of these apertures when he went to look at the place after the accident. The foreman also found both valves open. When the gas began to smell, the oxide became spent; and they turned one valve on and the other off. Oxide of iron was put into the purifiers to absorb the sulphuretted hydrogen, because it became a nuisance. His supposition was that his father smelt something, and then told Sandall to go and change the purifiers. He thought Sandall went up the ladder and took the plate or cap off the aperture before he turned off the valve. Previous to taking off the cap, he should have shut the corresponding valve; and he should first of all have put the cap on the other aperture. When he took the cap off, he would find the gas flowing out. Then he must have come down and opened the other valve, thinking this would relieve the first one. But he had not the plate on the second aperture. The result would be that he would get a double dose of gas coming from both valves. Then he (witness) thought his father, having discovered that Sandall had collapsed, rushed to his assistance, and was himself overpowered. The gas coming through the valves would be sulphuretted hydrogen, carbonic acid, and carbonic oxide, from the sulphate of ammonia plant. Sandall knew how to change the purifiers, because he had done it before. There was nothing wrong with the aperture. Everything was in perfect working order. The accident, in his opinion, was due to Sandall having made an error in the way in which he went to work. There was a valve in connection with the stills wherein the ammoniacal liquor was boiled; and if this was shut, it would stop the whole process. When the bodies were found the still was turned off.

In reply to the TOWN CLERK, witness said the gas that would escape from the aperture would be heavier than air, and it would have a downward tendency.

Herbert Fell, who has charge of the sulphate plant alternately day and night, gave evidence respecting the working of the valves.

Dr. *H. Keighley* described the condition of the bodies; and *Arthur Pickersgill*, the yard foreman at the works, gave evidence as to the finding of them. The latter witness said he had before seen Sandall do the work referred to.

The CORONER complimented Mr. A. Bromley on the way in which he had given his evidence under the distressing circumstances. He said it seemed very likely that his assumption of the way in which the tragedy had happened was the correct one. Sandall probably mounted the ladder, and was overpowered by an escape of foul gas. Mr. Bromley possibly found him in a state of collapse, and in attempting to save the man's life lost his own.

The FOREMAN: I think that Mr. Bromley has fairly given his life in trying to save the other one.

The Jury returned a verdict to the effect that both men met their death by accident. They expressed the opinion, however, that if the work of changing the purifiers had been in the hands of a practical man, the accident would not have happened. They therefore recommended that a practical man only should be entrusted with the duty in future. The Jury added that they felt that Mr. Bromley had given his life in attempting to save Sandall.

OTLEY GAS PURCHASE BILL.

Meeting of Ratepayers.

As has already been stated in the "JOURNAL," the Otley Urban District Council are promoting a Bill in the forthcoming session of Parliament to enable them, among other things, to purchase the undertaking of the local Gas Company, in accordance with a clause inserted in the Company's Act of 1901. The Bill includes other contentious proposals; but interest mainly attaches to the suggested acquisition of the gas-works.

When the time arrived, last Wednesday, for submitting the Bill to the ratepayers in public meeting, there was a large audience; and some disappointment was caused at the opening of the proceedings by the Chairman (Mr. E. Greaves) asking for an adjournment. He said the Council had hoped to be able to state at the meeting the purchase price of the gas undertaking; but owing to some little hitch, they had not yet come to a definite decision. The Directors had submitted what the Council considered a very reasonable offer; but it only came into his hands that evening, so there had not been adequate opportunity to consider it. The adjournment was therefore asked for in order that the Council could discuss the proposal, and the Directors of the Company could obtain the approval of the shareholders. He moved that the meeting be adjourned until Tuesday (to-day), when he would have a definite statement to make. Mr. Mudd asked what was the suggested price; and on this information being refused, he moved as an amendment that the meeting decline to sanction the Bill.

A lengthy discussion then ensued, in the course of which Mr. Garnett remarked that, unless a profit of £800 a year could be made, it was not in the interests of the town to buy the undertaking. Mr. Warnes thought the works would never pay; and he unkindly added that even if they were acquired for nothing, the Council would find some means of making the affair put another shilling or two on to the rates before very long. Mr. Marshall quoted figures for the purpose of showing that in Yorkshire towns where the gas-works were controlled by the municipalities, the ratepayers did not obtain such benefits as at Otley, where the price was only 2s. 10d. per 1000 cubic feet. At Dewsbury, he said, with three times the consumption, the price was 2d. more. He advised them to let well alone.

The amendment was negatived; and the adjournment was then agreed to by a large majority.

ROAD OPENINGS IN LAMBETH.

At the Meeting of the Lambeth Borough Council last Thursday, the Highways Committee reported that the Borough Engineer had communicated with the Chief Engineer of the South Metropolitan Gas Company (Mr. Charles Carpenter) and the officials of the Metropolitan Water Board, calling attention to the fact that certain openings had been made in Miles Street shortly after the completion of the repair of the roadway, although notice had previously been served upon them by the Council of their intention to execute these works. A reply had been received from Mr. Carpenter, in the course of which he said he had visited the spot and gone carefully into the matter raised in the communication. It was unfortunate that the fracture took place in the Company's main as it did; but the reason for it they had been unable to trace. There did not appear to be any settlement of the main, judging by the look of the fracture, nor, indeed, would this have been likely to occur, because the main was covered by the concrete of the road. He thought one of the reasons why there had been more than the usual difficulty in locating the fracture was that the road had been made, and very well made, up with hard core, broken Yorkstone, &c. Though this would form a very good top for the road, it would be very porous to the passage of gas, and allow it to travel freely from the point of escape. On the occasion of his visit, Mr. Carpenter saw that some not inconsiderable works had been carried out by the Metropolitan Water Board; and therefore he hoped all the blame for the opening had not been attached to the Gas Company. He said it was an oversight on the part of their people not to send an urgent opening notice, for which he had reprimanded them, and of which, he hoped, there would be no cause of complaint in future. He added: "It has always been my earnest endeavour to minimize as much as possible the inconvenience to the public which is bound to arise by reason of openings for gas and other works." The report went on to say that the Committee had ascertained in regard to the openings made by the Water Board that these were the result of an order from the Medical Officer's Department for an increased supply of water to Park Mansions, South Lambeth Road. The water service had therefore to be transferred to a larger main; and hence the disturbance complained of. No action was taken upon the report; it being merely received.

SALES OF STOCKS AND SHARES.

Last Tuesday, Mr. Alfred Richards conducted his first sale this year of gas and water stocks at the Mart, Tokenhouse Yard, E.C. It included four new issues of capital, all of which were placed at very good prices. The first lots consisted of £5000 of ordinary stock of the Guildford Gas Company, ranking for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; the last dividend on similar stock having been at the rate of 5½ per cent., free of income-tax. The stock was sold at £116 to £117 per £100. A new issue of £4000 of additional ordinary stock of the Southgate and District Gas Company, ranking for a maximum dividend of 7 per cent. per annum, and carrying one at this rate, was next offered; and it was all placed at prices ranging from £139 to £141 per £100 of stock. The succeeding lots consisted of a new issue of 400 additional ordinary £10 shares and £1000 of 4 per cent. perpetual debenture stock of the Lowestoft Water and Gas Company. The shares rank for a maximum dividend of 7 per cent.; but the last dividend on similar shares was at the rate of 5¼ per cent. per annum. They fetched from £11 to £11 12s. 6d. each. The debenture stock was sold at £108 to £109 per £100. The last lot submitted consisted of a new issue of £5000 of additional consolidated ordinary stock of the Maidenhead Gas Company, ranking for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; the last dividend paid on the Company's existing similar capital having been at the rate of £5 7s. 6d. per cent. per annum. They were all sold at from £100 to £101 per £100 of stock. Last Tuesday, Mr. Charles A. Joel offered for sale by auction at Newcastle, in accordance with an announcement which appeared in our advertisement pages, £54,000 of 7 per cent. maximum ordinary stock in the Newcastle and Gateshead Water Company. This constituted the balance of the stock created by the Company's Act of 1898. The highest price realized was £141 per £100, at which £6500 of stock was sold. At £140 10s., £5800 of stock changed hands; while £35,300 of stock fetched £140 per cent.—the reserve price. Immediately after the sale, the remaining lots were disposed of privately.

BRICKMAKING AT THE PLYMOUTH GAS-WORKS.

Inauguration of the New Plant.

On the invitation of the Directors of the Plymouth and Stonehouse Gas Company, a large number of gentlemen assembled at the gas-works on Thursday, to witness the inauguration of the plant which has been erected for making bricks from clinkers and spent lime. The majority of those present were architects, builders, and others possessing practical knowledge of bricks and their use. The Company were represented by Sir Joseph Bellamy (Chairman), Dr. J. H. S. May (Deputy-Chairman), several of the Directors, and Messrs. P. S. Hoyte (Engineer), H. B. Heath (Secretary), W. P. Tervit (Assistant-Engineer), and H. Coles (Outdoor Superintendent).

The new plant, which has been supplied and erected by Messrs. Johnson and Son, of Leeds, stands near the retort and purifying houses, from which the raw material for the manufacture of the bricks is drawn. A building formerly used in connection with a tannery which adjoined the gas-works proved admirably suited for the purpose of housing the machinery; and the whole operation is carried out in very compact works. The process is that patented by Alderman Lowden, of Leeds, and Mr. J. Bond, now Gas Engineer of the Southport Corporation, but formerly Superintendent of the New Wortley Gas-Works of the Leeds Corporation. The process has been noticed on several occasions in the "JOURNAL," but its chief features may be again described. In the first place the spent lime, mixed with clinker in the proportion of about four of the former to one of the latter, is carried by an elevator to a calcining tower, where it is converted into carbonate and silicate of calcium, the whole of the sulphur being driven off. This process is the special feature of the patent, and is the one upon which the successful performance of the remaining operations depends. After leaving the tower, the material is slaked with water, and mixed with more clinker in the proportion of about two of this material to one of calcium. It next passes through a tamping-mill, in which the proper mixture of water is added. The stuff is then delivered in clay-like consistency to a platform above a toggle press, through which it passes, and from which it emerges as well-shaped and well-pressed bricks. The press has a double delivery, making two bricks at one operation; and the capacity of the plant is equal to an output of about 10,000 bricks a day. As they are delivered by the press, the bricks are placed on waggons which are run into a heating chamber called an "autoclave." This is simply a long horizontal boiler, erected at the floor level, and having the front end removable. When the autoclave has been filled with bricks, the end is replaced and made steam-tight. Steam is then turned on at a pressure of about 110 lbs. to the square inch. This heat is maintained for twelve hours, and the bricks are then ready for use; the long process of baking in kilns which is needed in the case of ordinary clay bricks being quite unnecessary. Though under this process bricks can be turned out in so short a time, they compare very favourably with ordinary common bricks. In colour they are grey; and it does not seem probable that they will be used for outside work, except in circumstances where conventional appearance is of no account. For inside work, however, they appear to be as suitable as any other bricks.

Those which had been made at the Plymouth works and were stacked there on Thursday seemed hard, rang well, and when tested in a hydraulic press were proved to have good crushing strength. Bricks made by the process have been produced which bear not unfavourable comparison with the blue Staffordshire make; but the ordinary run would seem to be more on the lines of the common building brick. The crushing strength is 350 tons to the square foot; and the absorption of water only 4½ to 5 per cent. Mr. Bertram Blount, of Westminster, to whom bricks made by the process were submitted, subjected them to exhaustive tests, not for crushing strength and water absorption alone, but also for the effects of alternative freezing and thawing and power of resisting acids. His report was entirely satisfactory. Tests of the fire-resisting capacity of the bricks give equally good results; there being only 1 per cent. of combustible material in the bricks.

After inspecting the process, those present were invited to an informal luncheon. Mr. J. Y. Woollcombe, the Chairman of the Plymouth Chamber of Commerce, proposed, and Mr. T. Baker, the Chairman of the Mercantile Association, supported, the toast of "Success to the new undertaking." Both gentlemen congratulated the Gas Company on having started a new industry and on making something out of nothing, or that which had hitherto been only waste. Sir Joseph Bellamy, responding, said they believed the bricks would be of excellent quality, and that they could be produced at a price which would be acceptable to the trade generally. They were made of spent material which had been before them for many years, costing them trouble to get rid of. In these days of advancing competition in every direction, gas companies were compelled to look round and effect economies where they could save money. They occupied the position that day of being the first Company who had commenced brickmaking under that new process. The Leeds Corporation started the works, but they were ahead of them in Plymouth in actual results; and, after all, at Leeds they were not a company. They felt gratification that they were the first Gas Company to introduce the new process. They did not mind spending the capital, so long as the result, however small, was on the right side. They hoped to meet customers on fair business lines. Producing bricks at a price which would command a ready sale, they trusted that they would do some good, not only to themselves, but to the local industries using bricks.

Public Lighting in Deptford.—At the meeting of the Deptford Borough Council last Tuesday, it was resolved that 21 new gas-lamps and columns should be placed in the streets, at an estimated cost of £69 6s., and that 22 existing lamps should be refixed in improved positions, at an estimated cost of £13 15s. The foregoing work is to be carried out in accordance with the principle adopted by the Lighting Committee that the space between the street-lamps should be reduced to a distance not exceeding 50 yards.

COMPENSATION TO LONDON WATER DIRECTORS.

The following report on the above subject by the Special Arbitration Committee of the Metropolitan Water Board was presented at the meeting of the Board last Friday.

On the 28th October last, we reported to the Board the result of our negotiations with the East London Company on the subject of compensation to Directors, and the Board thereupon made an agreement with that Company to pay the sum of £17,419 3s., representing six years' purchase of the average fees received by the Directors during the five years ended June, 1904. Subsequently—viz., on the 25th of November—we reported the decision of Lord Revelstoke in the case of the New River Company, under which a sum of £76,917 17s. 10d. was awarded to the Company. We now have to report the decisions in the remaining six cases, in which, as the Board are aware, no agreement was come to, and in which the Local Government Board, under the provisions of section 48 of the Metropolis Water Act, 1902, appointed Lord Revelstoke to act as Arbitrator. We have had before us a report by the Solicitors on the result of the arbitrations; and, in view of the importance of the matter, we submit for the information of the Board the following observations on each of the six cases.

Chelsea Company.—In the case of the Chelsea Water-Works Company, the claim was for £18,000, which was said to be the amount required to pay an annuity on the basis of the Post Office tables to eight Directors. The contention on behalf of the Board in this and the following cases was that the Directors were only entitled to compensation in respect of the unexpired portion of the period for which they had been elected, together with a reasonable chance of re-election; and that the utmost compensation which should be given was five years' purchase of the average annual fees actually paid for the past five years. At the hearing of the claim, the Company asked that the amount might be increased by the sum of £900 in respect of income-tax; the fees having been paid free of that tax. The average annual fees actually paid to the eight Directors entitled to compensation was £1915 0s. 10d. The amount of the award was £13,692 11s. 10d.; being equal to 6·8 years' purchase of the fees and income-tax.

Grand Junction Company.—In the case of the Grand Junction Water-Works Company, the claim was for £23,330. The amount of remuneration voted to the Directors was £2500; and as one of them was not entitled to compensation, a deduction of £236 was made therefrom, and the remainder was divided *pro rata* between the remaining nine Directors. A further sum of £450 was added in respect of three of the Directors who represented the Company upon the Staines Reservoirs Joint Committee; and the claim was for a sufficient amount to give each of the Directors an annuity upon the Post Office tables equal to the amount of the fees said to have been paid to them. Income-tax was paid by the Company in addition to the Directors' fees; but nothing was included therefor in the original claim. On the other hand, the Directors serving upon the Staines Reservoirs Joint Committee had to pay their own income-tax; but the amount thereof was included in the before-mentioned sum of £450. At the hearing, the Company asked to be allowed to include income-tax in respect of the Directors' fees; and in this way the claim was increased to £24,350 17s. 11d. The average annual fees paid to the nine Directors, together with the average fees paid to the three representatives on the Staines Reservoirs Joint Committee, was £2731—*i.e.*, £2316 15s. 1d. as regards the Company, and £414 4s. 11d. as regards the Joint Committee. Counsel on behalf of the Water Board contended that the Directors serving on the Staines Reservoirs Joint Committee were not entitled to be compensated in respect of such services; but it is not possible to say whether or not the Arbitrator accepted this view, or whether he decided in favour of the Company's contention to the contrary effect. The amount awarded was £18,206 19s. 8d., which is equal to 7·4 years' purchase of the fees and income-tax, excluding fees paid to members of the Staines Reservoirs Joint Committee, and to 6·3 years' purchase of the fees and income-tax, including the Staines fees.

Kent Company.—In the case of the Kent Water-Works Company, the claim was for seven years' purchase of the total remuneration voted by the Company to the Directors—viz., £3000—or a total claim of £21,000. Income-tax was paid out of the remuneration, and consequently no revised claim was put forward at the hearing. The attention of the Arbitrator was directed to the fact that, in spite of a statutory provision that "the number of the Directors of the Company shall be nine," no steps had been taken to fill up certain vacancies which occurred between the notice for the Bill for the Act of 1902 and the appointed day; and the Arbitrator was asked, on behalf of the Water Board, to state his award by way of a special case, so as to permit the Board to take the opinion of the High Court if he decided against the contention that such vacancies ought to have been filled up, and the payments to the six Directors entitled to compensation decreased thereby. The average annual amount actually paid to these six Directors was £2319 11s. 7d. The amount awarded was £19,097 5s. 9d., which is equal to 8·2 years' purchase of the fees paid, or 7·8 years' purchase of the fees together with income-tax. But if the High Court is of opinion that the shareholders of the Company were not under an obligation to fill up the vacancies which occurred between the date of the publication of the notice for the Bill for the Act and the appointed day, then the Water Board are to pay to the Company a further sum of £801 14s. It will be for the Company to take any steps which they may be advised should be adopted with a view to obtaining a decision on the legal question above mentioned.

Lambeth Company.—In the case of the Lambeth Water-Works Company, the original claim was for £32,004, which it was stated was the sum required to provide annuities for each of the eight Directors entitled to compensation based upon the Government annuity tables. Subsequently to the discussion of the New River Company's claim, the Lambeth Company revised their claim in respect of income-tax, which the Directors caused to be paid on their own behalf in addition to the remuneration voted by the Company for their services. The revised claim amounted to £33,917 6s. 7d. The average annual fees paid to the eight Directors was £2830 7s. 7d.; but the attention of the Arbitrator was directed to the fact that one of those Directors had died

STATEMENT *showing the Result of Claims by the Water Companies for Directors' Compensation.*

Company.	Amount Claimed.	Revised Claim.	Amount Awarded.	Average (Five Years) Annual Fees Actually Paid.	Years' Purchase of Fees Paid *plus* 5 p. ct. for Income-Tax.
Claims dealt with by the Arbitrator.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
New River	110,913 8 4	110,913 8 4	76,917 17 10	9,506 8 3	7·7
Chelsea	18,000 0 0	18,900 0 0	13,692 11 10	1,915 0 10	6·8
Grand Junction	23,330 0 0	24,350 17 11	18,206 19 8	2,316 15 1 414 4 11*	7·4 or 6·3
Kent	21,000 0 0	21,000 0 0	19,097 5 9†	2,319 11 7	7·8
Lambeth	32,004 0 0	33,917 6 7	22,054 3 7	2,830 7 7	7·4
Southwark and Vauxhall	25,964 1 3	27,262 5 1	18,789 1 4	2,777 13 1	6·4
West Middlesex	43,470 3 9	44,487 4 5	33,110 6 11	3,385 9 0 575 4 10*	9·3 or 7·9
Totals for the seven cases decided by the Arbitrator	274,681 13 4	280,831 2 4	201,868 6 11	25,051 5 5 989 9 9* 26,040 15 2	7·6 or 7·3
Claim agreed with the Company.					
East London	35,895 0 0	35,895 0 0	17,419 3 0	2,903 3 10	5·7‡
Totals	310,576 13 4	316,726 2 4	219,287 9 11‡	28,943 19 0	7·3 or 7·2

* Fees paid to members of Staines Reservoirs Joint Committee.
† Subject to possible addition of £801 14s. if the legal point decided by the Arbitrator is reversed by the High Court.
‡ The agreement arrived at by the Board was for six years' purchase of the fees actually paid, no allowance being made for income-tax.

shortly after the appointed day. The amount awarded was £22,054 3s. 7d., equal to 7·4 years' purchase of the fees and income-tax.

Southwark and Vauxhall Company.—In the case of the Southwark and Vauxhall Water Company, the original claim was for £25,964 1s. 3d. in respect of life annuities to the seven Directors entitled to compensation on the Post Office tables. At the hearing, the Company applied to amend the claim by adding income-tax; the revised claim being £27,262 5s. 1d. In this case also a Director had died soon after the appointed day. The average annual fees actually paid were £2777 13s. 1d.; and the amount awarded was £18,789 1s. 4d., which is equal to 6·4 years' purchase of the fees and income-tax.

West Middlesex Company.—In the case of the West Middlesex Water-Works Company, there were eleven Directors entitled to compensation; and the amount claimed was £43,470 3s. 9d., of which £37,817 1s. 3d. was in respect of services as Directors of the Company, and £5653 2s. 6d. in respect of the three Directors who represented the Company upon the Staines Reservoirs Joint Committee. Upon details of the claim being applied for, the Company increased their claim, and asked for £38,834 1s. 11d. in respect of the directorships of the Company, and £5653 2s. 6d. in respect of the three Directors who were members of the Staines Reservoirs Joint Committee, or a total of £44,487 4s. 5d. The average annual fees paid were £3385 9s. by the West Middlesex Company and £575 4s. 10d. through the Staines Reservoirs Joint Committee, or a total of £3960 13s. 10d. The amount awarded was £33,110 6s. 11d., which is equal to 9·3 years' purchase of the fees and income-tax, excluding fees paid to members of the Staines

CARBURETTED WATER-GAS APPARATUS

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 6,800,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Reservoirs Joint Committee, and to 7·9 years' purchase of the fees paid and income-tax, including the Staines fees.

We append a statement showing the results of the whole of the arbitrations on the question of compensation to Directors, from which it will be seen that the total amount of the revised claims dealt with by the Arbitrator was £280,831 2s. 4d., and that the amount unconditionally awarded by him was £201,868 6s. 11d., which will be increased by £801 14s., making a total of £202,670 os. 11d., if the Kent Company obtain a decision of the High Court in their favour. The total average annual fees paid to the Directors of these Companies was £25,051 5s. 5d., or, if the Staines fees are added, £26,040 15s. 2d.; and the amount awarded is equal to 7·6 years' purchase of the former figure, or 7·3 years' purchase of the latter figure and income-tax.

In all the cases which went to arbitration, the Water Board have to pay the costs of the Companies, which, including the Arbitrator's fees, will be taxed as between party and party. With regard to the fees of the Arbitrator which were paid by the respective Companies in taking up the award, we understand that in the New River case the fee is 500 guineas, and in each of the other cases 100 guineas.

METROPOLITAN WATER BOARD.

The First Meeting of the Board after the Christmas recess was held on Friday, at the offices of the Metropolitan Asylums Board—Sir R. M. BEACHCROFT in the chair.

The Finance Committee presented a report, in the course of which they stated that, in accordance with the resolution passed on the 9th ult., notice had been given to the New River Company of the intention of the Board at their next meeting to create additional "B" stock to discharge the compensation payable to that Company in respect of the transfer of their undertaking. The Committee now asked the Board to pass the necessary resolutions creating further stock to be issued to an amount not exceeding £6,534,000. The Committee also stated that they had received letters from the Councils of the Metropolitan Boroughs of Marylebone, Hampstead, and Hammersmith, and also from the Joint Committee of the borough of Ealing and the urban districts of Acton and Chiswick, protesting against the discontinuance of the rebate in the West Middlesex district. The necessary resolutions in regard to the further issue of stock were passed.

The Special Arbitration Committee submitted a report on the result of the arbitrations in regard to the compensation to be paid to the Directors of the Water Companies. It is given in full on p. 240.

The Works and Stores Committee reported that, on the advice of the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.), they had authorized him to use the water in the Staines reservoirs whenever he considered such a course necessary.

A statistical return of the supply of water for November last was presented. It showed that the total average daily supply during the month was 210,669,000 gallons; and the number of houses, &c., supplied was 993,387—the estimated population being 6,600,336. The mean supply per head per day amounted to 31·8 gallons, against 32·8 gallons per head per day during the corresponding month of 1903. The quantity of water in store in impounding reservoirs at the end of the month was 3369 million gallons, in addition to which there were 3300 million gallons in the Staines reservoirs. There were 1852 additional supplies connected, and 7074 yards of new mains laid down. The number of fires in all the districts was 343; Southwark and Vauxhall heading the list with 116, New River following with 79, East London with 47, Grand Junction and West Middlesex each with 32, Lambeth with 18, Chelsea with 12, and Kent with 7.

BROKEN WATER-PIPES AND DAMAGED ROADS.

Last Tuesday the Kensington Borough Council considered a report presented by the Borough Engineer and Surveyor (Mr. W. Weaver, M.Inst.C.E.) with reference to a question raised by the Engineer of the Chelsea District of the Metropolitan Water Board as to the rendering of accounts for watching, guarding, and making good the roadways damaged by subsidences caused by broken water-pipes. He explained that the Engineer was raising the question that, in cases where the Borough Council render the usual accounts for watching, guarding, and making good the damaged road, the Water Board should repudiate liability for such accounts, or such portions thereof, as might be due to the water service as distinct from the main—the householder to be liable for the former and the Board for the latter. The practice hitherto has been for the road authority to charge the Water Company, leaving the latter to recover from the householder any expense for which he may be legally liable; and Mr. Weaver pointed out that the new practice would open the door to very great difficulties for the Borough Council, and should, in his opinion, be resisted. He went on to offer the following remarks upon the subject: "The present position of the householder with regard to his water service is somewhat absurd. He cannot connect to the water-main until he has paid the Water Board for opening the road and supplying and fitting the ferrule; and he also has to employ a plumber to lay in the service-pipe. The plumber has to take out a licence from the Council to open the road to lay in the pipe. The water officials take care that the ferrule is properly fixed and connected; but little or no supervision is exercised by them over the laying of the service. I am strongly of opinion, as evidenced by me before the Water Inquiry in 1895, that the water services should be laid by the water authority from the main to the stop-cock, in the same way that gas services are laid by the gas companies from main to meter. I think it is somewhat absurd to contract with a body to supply your house with water, and that body to bring the water to the middle of the road and leave you to bring it into

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your premises. Water services and gas services should be on the same footing; and if the Water Board could be induced to adopt my views, I do not think the change would lead to increased water-rate, as the services would be better laid, insuring very much fewer breakages, with consequent loss of water, leaving out of consideration the damage and inconvenience saved by lessened disturbance of the highways." The Council concurred in these views, and resolved to embody them in a communication to the Water Board.

TORPOINT WATER BILL.

A Meeting of Ratepayers of Torpoint held yesterday week unanimously confirmed the decision of the Urban Council to promote a Bill for providing a new water supply for the district. Mr. T. E. Reynolds, the Chairman of the Council, who presided, spoke of the difficulties which attended the supply of water under present conditions, and said that the rapid growth of the place could be seen from the fact that in 1888 the income from water was £218, while now it was £720. Mr. J. T. Bond, the Solicitor to the Council, pointed out that a largely-increased supply was necessary, because of the new establishments which the Admiralty were about to build in the district; and he said that if the Council had not responded to this demand, a company would have been formed to acquire the powers now being sought by the Council. The Bill provided for the abstraction of 500,000 gallons of water a day from Withey Brook. On the financial side, the outlook for the scheme was exceedingly healthy and gratifying. The Admiralty, recognizing the inability of the district to bear the heavy burden, were willing to make such a contribution as would relieve the shoulders of the ratepayers; and with the exception of the years 1908, 1909, and 1910, in which the cost of the promotion of the Bill would have to be met, they might look forward to the undertaking yielding an income sufficient to balance the expenditure. From the Government they would receive a total contribution of £1300 a year, of which £1000 would be paid by the Admiralty and £300 by the War Office. The Admiralty would bear half the cost of promoting the Bill; and the War Office would pay £1500 further towards the fund. Five years after the commencement of the revenue period, the terms were to be subject to revision; but there was an engagement that the Government contribution could not go below a certain point so long as the loan repayment continued. The revenue would begin as soon as they were in a position to supply the Admiralty with water; and for this they were limited to eighteen months. Mr. James Diggle, the Engineer of the scheme, said the source which was to be tapped would yield on the driest day of summer four times the quantity of water they required.

Opposition to the scheme is threatened by Mr. F. R. Rodd, owner of the estate through which the Withey Brook runs, on the ground that the river will be rendered virtually dry in summer, to the destruction of its picturesque features and the injury of its usefulness in driving a sawmill. Mr. Diggle, however, in his original report to the Council, stated that the Withey Brook has a collecting area of nearly 6 square miles. The minimum flow in time of long-continued drought will not be less than 1¾ million gallons per day; while the average flow will exceed 5 million gallons. He is of opinion that monetary compensation for any proved damage will be more economical than the construction of a compensation reservoir.

UNFORTUNATE WATER SCHEME AT ABERTILLERY.

A Dangerous Reservoir.

A disastrous state of affairs with regard to the water supply was revealed to the ratepayers of Abertillery, at a meeting convened to consider the promotion by the District Council of a Bill to enable them to obtain a further supply of water and abandon the construction of the second reservoir authorized by the Act of 1902.

The Chairman of the Council (Mr. J. Tarrant, J.P.), who moved the resolution approving of the Bill, explained that the Council proposed to seek relief from certain obligations to supply compensation water to colliery companies and riparian owners, and from the necessity imposed upon them of constructing a second reservoir. Mr. Stewart, in seconding, stated that the Council had been unable to complete the first reservoir under the act of 1894 (which also it was sought to amend), owing to underground workings; and they had been advised by their Engineer, Mr. Togarmah Rees, M.Inst.C.E., that it would not be prudent to proceed with the second reservoir. They had been threatened with writs by colliery companies interested for not proceeding with this reservoir. One company's workings were approaching the site proposed for it; and they wanted to know what the Council proposed to do. Since they started the first reservoir, certain springs had been diverted from the district by colliery workings, so that they would have to get a further supply. They were negotiating with the Ebbw Vale Council; and if they failed to agree to terms, they would have to face the question of looking for a supply outside the coal measures, in Breconshire. Mr. Rees said they had constructed a reservoir to hold 40 million gallons; but they found it would be dangerous to fill it, owing to the sliding of the mountain in consequence of the workings beneath, which had become much more pronounced in recent years. If they had 20 million gallons in the reservoir, and there was a sudden flood in the night, and no waterman was on the spot, the whole of the embankment would give way; and he would not like to say what would become of the inhabitants of the Cwmtillery Valley. Moreover, while the 1894 scheme was intended to serve 15,000 people, they had now to consider a population of 25,000. They would still utilize the water from the present works, though they would have to find other sources as well.

The resolution was adopted.

R R

Hire

Gas

Fires.

Coldest Weather Coming.

RICHMOND'S { LONDON WARRINGTON STRATFORD

R R

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In a column which the proprietors of the "Scotsman" devote weekly to the elucidation of some subject in science or nature, there appeared on Tuesday last an article upon "Gas as the Source of Power in the Future." The writer said that the Nineteenth Century had often been described as the century of steam, and went on to narrate that in recent years the practice of working with high pressures had led to much greater cost in steam-conveying apparatus, as the consequence of which, engineers casting about for a substitute have had coal gas suggested to them. In a gas-engine, not only can a much higher temperature be produced with no greater pressure, but the pressure may with safety be very considerably raised by reason of the process employed. Then he exploded the popular notion that gas-engines are only useful for small powers, by stating that engines of 1500-horse power have been constructed and are working satisfactorily. As to the power obtained, he said that the most recent engine, designed by Mr. Dugald Clerk, transforms about 27 per cent. of the heat obtained from gas into power. The best steam results are those from a Schmidt engine—a very costly type—and are only 21 per cent. of the heat of the steam. That was to say, for any given power, about a quarter of the coal bill could be saved if a modern gas-engine were substituted for even the best steam-engine. Reference was made to the manufacture of producer gas, as to which it was stated that the prime cost of a complete installation was somewhat higher than the cost of a steam boiler and engine; but, allowing for repairs, inspection, and interest on capital, to instal gas in place of steam would lower the price of power considerably. In schemes for the distribution of steam to small works, the loss of heat in the process of distribution was enormous. This was not the case with gas, as it did not deteriorate in any way when conducted through pipes, and it could be led for any distance without loss in quality. It was, therefore, evident to the author that there might be a great future for companies manufacturing and distributing gas for power purposes.

The illuminating power of the gas supplied in Edinburgh formed the subject of a short discussion in the Town Council of Edinburgh on Tuesday. It was reported that on Dec. 27 the gas, tested in the New Street works (the old Edinburgh works, now disused), was of an illuminating power of 21·71 candles. Mr. Balfour asked if this were sufficiently high. Lord Provost Sir Robert Cranston said he read the other day of a town in England where the gas was of 15 candle power, and they were highly satisfied with it. Mr. Fraser asked what had become of the report as to the quality of the gas which they were to have got from a certain Professor about a year ago. The Lord Provost said he could not answer, but would make inquiry. The subject then dropped.

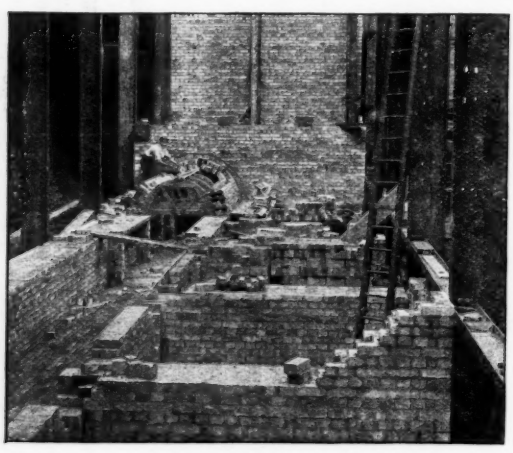
The Falkirk Town Council have, in the prosecution of their scheme for the erection of new gas-works, agreed, on the advice of Mr. W. M'Crae, the Engineer and Manager, to borrow £45,000 for the work. In the opinion of the Finance Committee, this sum should be ample for all purposes. The Council on Monday resolved to appeal against the amount of assessment imposed upon the gas-works for poor and school rates. The Works Committee reported that the Engineer had submitted to them drafts of specifications for the coal charger and discharger, coal-handling plant, coke-handling plant, purifiers, station meter, and condensers, and that these were approved of; and he was instructed to invite offers for the supply of the plant. The Council approved of the Committee's action. They also agreed to accept the offer of Messrs. W. C. Holmes and Co., of Huddersfield, for the supply of a tar-extractor and scrubber-washer; and they further agreed to accept the offer of Messrs. Clayton, Son, and Co., Limited, of Leeds, for the removal of a gasholder to the new works, and the increase of its capacity by one half.

The Dumfries Town Council last week received reports from two of their number, and from Mr. G. Malam, the Gas Manager, upon their visit to the Gas Exhibition at Earl's Court. In their joint report, the two Commissioners said that the quality of the gas which gave such splendid results as they saw was only 14 candles, as compared with the 24 candles they supplied in Dumfries. The London Gas Companies were able to supply gas at a very cheap rate, by avoiding the use of expensive coal. For lighting, they found the pressure to be about the same as in Dumfries—from 1½ to 2 inches; but the most brilliant effects were produced by gas burned at high pressure. Mr. Malam, in the course of his report, enumerated various apparatus which he had examined, and, with regard to conveyors, said that at no distant date it might be advisable to introduce labour-saving plant into the Dumfries Gas-Works. The reports were received, and the deputation voted their expenses—£22, which Mr. Currie thought astonishingly cheap.

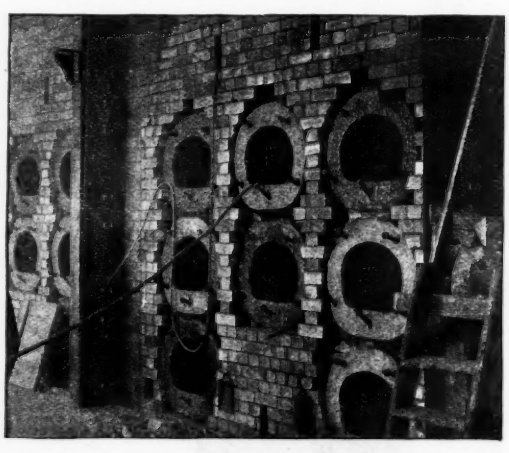
The Moffat Town Council were recommended to make a demand upon the Moffat Gaslight Company for a payment of £20 a year as wayleave for the gas mains and services; but when the proposal came before the Town Council last week, it was defeated by a motion that the Company be charged so much per yard of street opened up by them, the same as other ratepayers. A proposal to have a meeting with the Directors of the Company, with a view to coming to some amicable arrangement as to payment of a charge for wayleave, was also defeated.

It is reported that the Burghs (Scotland) Gas Supply Acts were adopted by the Corporation of Monifieth in the expectation that they would be able to acquire the undertaking of the local Gas Company for from £5000 to £6000, but that, on the Corporation approaching the Company, they have ascertained that the lowest price which they are prepared to accept is £7500. There is also the prospect of additional capital outlay. The surmise has, consequently been thrown out that the gas transfer will either require to be dropped, or that the Corporation will have to go elsewhere for a gas supply, which would, naturally, be to Broughty Ferry or Dundee.

Of late, the community of Dundee have been a good deal agitated upon the question of the legality of paying pensions to retired officials



JULY 25th, 1904.



OCTOBER 15th, 1904.

12 Beds of Inclined Retorts, Erected by us, the whole of the Work being done by our own Men.

RESULTS GUARANTEED.

NEW CONVEYOR CO., LTD., SMETHWICK.

and their representatives. To set the matter at rest, a memorial asking their opinion was submitted by the Town Council to three members of the Scotch bar. These have now replied that, in their opinion, the Town Council have no authority to pension any officials or their families, except in the case of police constables, for whom there is special provision. Such payments are illegal, and must be stopped. A list of the pensions at present being paid was attached to the memorial, from which it appears that there are six pensioners in the Water Department, receiving £136 yearly; and 19 in the Gas Department, receiving £300. There are 48 persons in receipt of pensions, the total sum distributed among them annually being about £1270.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 21.

Sulphate of Ammonia.

The week opened quietly; but it was early observed that ready parcels were being picked up at last week's closing prices by buyers who had for some time been trying to get in at a further decline. Later, when prices were seen to be hardening, direct buyers were more in evidence, and near the close keener competition brought about a more decided recovery in values. The bulk of the buying has, however, been for covering January contracts; and this has probably been expedited by the strike at the collieries in Germany. So that at the close the quotations are £12 17s. 6d. to £13 per ton f.o.b. Hull and Liverpool, and, Leith having taken the lead, £13 3s. 9d. per ton f.o.b. Leith. In the forward position, makers have maintained their firm attitude, and although there has been considerable inquiry, actual business done has not been very large.

Nitrate of Soda.

This article is firmer at 11s. 3d. to 11s. 6d. per cwt., according to quality, with more business passing.

LONDON, *Jan.* 21.

Tar Products.

Markets generally are quiet; and there has not been much business doing during the past week. Benzol continues quiet. Business was done in 50-90 per cent. at 7½d. per gallon for home consumption in the North of England; while some 90 per cent. was sold at 9½d. for shipment from a Northern port, although London makers are reported to have declined 10d. in more than one instance for February-March delivery. The position of toluol and solvent remains precisely the same; and there is really no business doing in either of these articles just at present. Creosote is still quiet. Business has again been done in Yorkshire at 1¼d. for early delivery, although the largest makers are still refusing to sell at this price. In London, there is no fresh business to advise. The principal makers still quote 1⅝d.; but certainly less than this would be accepted by some distillers. The actual value may be taken as about 1⅝d. to 1¾d., according to situation and time of delivery. Carbolic acid continues very dull; and consumers do not appear to take much interest in the article just at present. As regards the German consumers, doubtless the severe weather has prevented their buying for prompt delivery; and as to forward, they appear determined to hold off the market just now. Prices are nominally from 2s. ½d. to 2s. 1d. for 60's, January-March delivery; but it is difficult to trace any actual business as having been done during the past week. The position of crystals remains the same—the market is quiet, and prices do not show any signs of improvement. In pitch, business has been limited during the past week, although there has been a good deal more inquiry, both from the Continent and South Wales, doubtless owing to the strike in Westphalia, which may have a considerable effect upon the market for this article. The principal London manufacturers still quote 37s. to 37s. 6d.; but there is no doubt that dealers would accept considerably under these prices. Contracts are now reported as having been made in South Wales for early delivery at fairly low prices; but dealers do not appear at all anxious to place any further quantities, except at an improvement in value. The demand does not at present seem to have improved so much as was expected; but there is little or no doubt that fuel makers generally are more disposed to consider business over the next three or four months than was the case a little while ago.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 35s. to 36s. 6d.; east coast, 33s. 6d.; west coast, 32s. 6d. to 33s. Benzol, 90 per cent., 10d.; 50-90 per cent., 8d. Toluol, 7½d. Crude naphtha, 3½d.; solvent naphtha, 8½d. to 9d.; heavy naphtha, 10d. Creosote, London, 1½d. to 1⅝d.; North, 1½d. Heavy oils, 2 1/16d. to 2⅛d. Carbolic acid, 60 per cent., 2s. ½d. to 2s. 1d. Refined naphthalene, £4 to £9; salts, 18s. to 20s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

There has been certainly more inquiry during the past week, and prices have a decidedly firmer tone. Doubtless the strike in Westphalia has had something to do with this, as it will certainly reduce the production of sulphate of ammonia in Germany very considerably for the time being. As regards Beckton, the Gaslight and Coke Company would be willing to entertain business at from £13 7s. 6d. to £13 10s.; but buyers are not at present prepared to pay these prices, although at from £13 5s. to £13 6s. 3d. there is not the least doubt that a very considerably quantity could be placed. The position of the South Metropolitan Company remains the same. They have not very much to spare for January-February, and will not accept anything under £13 7s. 6d. Sales are reported in Hull at £13 for January, and £13 1s. 3d. for shipment early in February; while for the end of the latter month makers ask £13 2s. 6d. Sales were reported in Leith in the early part of the week at £13 1s. 3d. But later on business was done at £13 2s. 6d.; and in some instances this price is reported to have been declined by manufacturers, who are asking £13 3s. 9d. to £13 5s. for prompt shipment. As regards forward business, they do not seem disposed to offer anything just at present.

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MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 120 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gaslight and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Ten Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
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COAL TRADE REPORTS.

Lancashire Coal Trade.

The extensive strikes among the coal miners of the Continent has caused a flutter of excitement in the English coal markets. The northern coalfields have already been drawn upon for supplies; and should the strike continue, Yorkshire and Lancashire will be eventually benefited. Prices at Newcastle are reported to have advanced for coal for export from 12s. to 15s. 6d. per ton. So far as increased trade is concerned, the Lancashire coalowners are quite ready to meet it. Full time is being worked at the pits; but if necessary extra shifts could be put on and the output increased. It is too soon to expect any change in the Lancashire conditions. Much coal can be sent to Dutch and German ports from Scotland and the Northern English ports before Lancashire would be directly called upon; but the effect of excessive shipments from other ports than Manchester would in a short time benefit our trade generally. The home demand is better than it was. The exigencies of the weather and better trade prospects have caused an increased general demand for all classes of fuel; and while prices do not as yet show much betterment, there is good reason to believe that more money is very likely to be asked for coal in the near future. Quotations are: Best house coal 13s. to 14s. per ton at the pit, secondary 11s. to 12s., and ordinary 9s. to 10s. Steam and forge coal is meeting with a fair demand at 8s. 3d. to 8s. 9d. per ton, best slack is 7s. 6d. to 8s., medium 6s. to 6s. 9d., and common 4s. 3d. to 5s. A fair amount of coal is passing to the Ship Canal, not only for steamers, but for export to Western English ports and to Ireland.

Northern Coal Trade.

The coal trade has been very greatly influenced, and to some extent excited, by the strike in the German coal trade. The demand thus created has given activity to many of the mines, and has forced up the prices of several kinds of coal, owing to the pressure of the requirements. In the steam coal trade, this has been marked; and the prices have risen, but so irregularly as to render accurate quotation difficult, as they vary from day to day. Best Northumbrian steam coals are about 10s. 6d. per ton f.o.b., for prompt delivery, and second-class steams are about 9s. 3d.; so that the prices are fully 1s. per ton higher than before the strike. The coke market has not found the impetus as yet; but it is probable that more gas coke may be exported. At present, the quotation is from 13s. to 13s. 3d. f.o.b. The advance, however, in the rate of freights will influence the coke supplies, and also in some cases the cost of the gas coal at the port of delivery. Gas coal is very little altered so far; but the demand is full, and prices are firm, and in some cases 3d. per ton above those last quoted.

Scotch Coal Trade.

There is continued activity in the coal market, part of which is attributed to the strike in Westphalia; but part is also due to improved trade. Prices are accordingly firm, and in some cases have already risen. The rates quoted are: Main 7s. 6d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 3d., and splint 8s. 9d. to 9s. The shipments for the week amounted to 133,731 tons—an increase of 34,491 tons upon the preceding week, but a decrease of 53,164 tons upon the corresponding week of last year. For the year to date, the total shipments have been 234,992 tons—a decrease of 65,872 tons upon the corresponding period of 1904.

TRADE NOTES.

Artistic Calendars for 1905.

"Variety is Charming" is an aphorism specially applicable to a number of calendars we have received from Messrs. John E. Williams and Co., paint and cement manufacturers, of Manchester. Some of them are highly artistic reproductions of paintings, and all are very well executed. Indeed, they seem to be almost too good for office use, for which, it may be presumed, they are intended. Another artistic calendar is the one issued by Messrs. Glover and Main, Limited. It is much larger than those just referred to. The centre (8 in. by 10 in.) is occupied by an embossed head of a figure with closed eyes representing "Success;" and below it is a tear-off monthly calendar, with changes of the moon, in white figures on a black ground. The titles of the firm with their telegraphic addresses and telephone numbers, occupy the top portion of the card; and on either side of the figure and the calendar are the various branches.

Hazell's Annual.

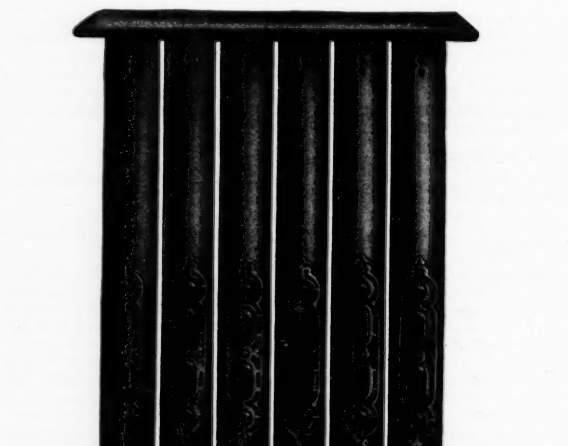
We have received from Messrs. Hazell, Watson, and Viney, Limited, "Hazell's Annual" for the current year. It is claimed for this work that, more than any other yearly book of reference, it aims at being encyclopædic in character; but the main object of the proprietors is to embrace, so far as is practicable within one volume, all the information that most readers will need during the year with reference to the men and the topics of the day. This object appears to have been well carried out by the Editor (Mr. W. Palmer), who has included among the special features of the volume a summary of the most important legal decisions of the past twelve months and a review of the chief engineering schemes throughout the world. With regard to the interests with which our readers are specially concerned, the latest available statistics relating to the gas undertakings of the United Kingdom are given; there is a sketch of electrical progress during 1904; and the circumstances attending the transfer of the water undertakings to the Metropolitan Water Board are presented in a condensed form, which allows of the principal facts and figures being apprehended almost at a glance. The "Annual," which has nearly reached its majority, is crammed full of general information, which is conveniently arranged in alphabetical order; while reference to any subject is facilitated by a copious index.

Local Government Annual.

We have received from Mr. S. Edgecumbe Rogers "The Local Government Annual and Official Directory" for 1905. This is the fourteenth annual issue of this useful compilation, the main portion of

The "MAIN"

Gas Fires



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which is devoted to the directory, which gives the names and addresses of the chief officials of all Corporations, London Borough Councils, County Councils, Boards of Guardians, Urban and Rural District Councils, &c., throughout the kingdom. One important feature of this section is the list of members, with their addresses, of the Metropolitan Water Board. In addition to the directory, there is a quantity of information relating, among other things, to the electric light undertakings in the boroughs of London. The charges for water and gas in London are also given. Altogether, the book will be found useful by persons connected with local government.

Gas Consumption and Cookers at Southport.—On the 14th inst., the consumption of gas at Southport reached 2 million cubic feet, compared with 1¼ millions on the corresponding day of last year. The announcement of the reduction in the fees for hiring gas-cookers, referred to last week, is giving a fillip to consumption. The revised rentals come into operation on the 31st of March.

Fatal Acetylene Explosion.—An inquest was held a few days ago, at Egginton, Burton-on-Trent, on the body of John Bakewell, a wheelwright, who was killed by an acetylene explosion. Deceased was called in to do some repairs to a generating plant; and having found a leak, he proceeded to use a soldering iron. Though precautions had been taken to clear the apparatus of gas, there was a loud explosion; and the unfortunate man was thrown to the ground with such force as to break his neck.

Proposed Purchase of the Scalby Water-Works.—The Local Government Board have sanctioned the application of the Scalby Urban District Council to borrow £3000 for the purchase of the Scalby Water Company's property and undertaking, the repayment to be made within 20 years. Before granting permission to borrow £500 for the extension of the water-works, the Board desire to be furnished with the Council's remarks on the claim of the Scarborough Corporation to the exclusive right of supplying water within a portion of the Scalby urban district.

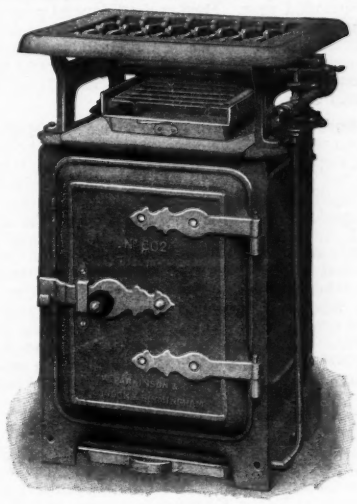
Inauguration of a New Holder at Newbury.—The completion of an additional holder at the Newbury Gas-Works has been celebrated in an interesting manner; members of the Corporation and others taking tea together in the interior of the large structure. They were lowered into the steel tank by means of a powerful crane, to which was attached a wooden carriage. The descent was safely accomplished; and tea was served on the floor of the holder. Congratulatory speeches were made, toasts drunk, and the novel conditions much enjoyed by all who had the good fortune to be present.

Suffocation by Gas at St. Leonards.—A widow, named Ann Noakes, aged 79, of No. 80, Norman Road, St. Leonards, died last Wednesday morning from gas poisoning. Her son, with whom she resided, was aroused about three o'clock by a strong odour of gas pervading the house; and after turning off the meter-tap and opening the windows, he went to the assistance of the occupants. He found his mother unconscious; and on medical aid being procured, it was announced that she had been poisoned by the escaped gas. No one else in the house was in danger; but a woman in the next house, to which the escape extended, was discovered in an unconscious condition. After treatment she recovered. The trouble was traced to a pipe under the pavement immediately outside the house. This had become fractured; and the earth being loose, the gas easily made its way into the basements of the houses.

The Depth of Gas-Mains in Wandsworth.—At the meeting of the Wandsworth Borough Council last Wednesday, the Highways Committee reported that, under the provisions of the Wandsworth and Putney Gas Act, 1900, the Gas Company, before putting down mains in new streets not taken over by the Council, are required to give three days' previous notice to the Council, who must, within 48 hours, notify to the Company the reasonable depth from the surface and the position in the road where the mains are to be placed. In the event of the Council not giving the notification referred to, the mains may be laid as the Company think fit. The Committee recommended that the depth under carriage ways should be not less than 2 ft. 6 in., and under footways not less than 2 feet from the surface; and that the Company should be asked to adopt these depths when relaying existing mains or putting in new ones in the roads of the parish. The report and recommendation were adopted.

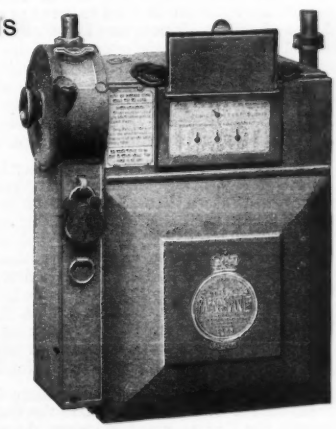
Lichfield and the Electric Light.—At the last monthly meeting of the Lichfield City Council, a resolution was proposed that consent should be given to a Provisional Order to supply (under certain conditions) electricity for public and private purposes within the city being granted by the Board of Trade to Messrs. Foote and Milne. Alderman Fowler, who is a shareholder in the Gas Company, said he should like to ask the Town Clerk whether those who were more or less interested would be allowed to speak, as it was a most serious matter. The Town Clerk replied in the negative. Mr. Benson said as the question was one of great importance, and as that was probably the last opportunity they would have, he should like to appeal to the Mayor to allow those who were interested in the Gas Company to speak. It might not perphaps be strictly in order; but they should concede a little on such an occasion. The Mayor said he was afraid it was not possible for him to do that. He was told that nobody who had a pecuniary interest in public lighting could be allowed to speak or vote. He was given to understand that Mr. Macmorran, K.C., Mr. Asquith, K.C., M.P., and two other learned Counsel had given opinions to this effect. The Town Clerk said section 22 of the Municipal Corporations Act was imperative—"A member of the Council shall not vote or take part in the discussion of any matter before the Council, or a Committee, in which he has directly or indirectly, by himself or by his partner, any pecuniary interest." Alderman Fowler said if he could not vote he would protest. He considered the agreement entered into was very prejudicial to the city; and he was much more interested in the welfare of the city than in that of the Gas Company. The resolution was carried.

PARKINSON'S



SLOT INSTALLATIONS

FOR QUOTATIONS



WRITE—

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Reduction in Price at Hexham.—The Hexham Gas Company have given notice that the price of gas has been reduced, as from the 1st inst., from 3s. to 2s. 10d. per 1000 cubic feet, subject to the existing scale of discounts.

Collection of Water Rates in the Metropolis.—The Comptroller of the Metropolitan Water Board (Mr. F. E. Harris) has issued a notice pointing out that, inasmuch as the financial year of the Board terminates on the 31st of March in each year, it is necessary to adjust the collecting periods in order that they should terminate on the 31st of March next, and for this purpose to collect the water-rate falling due on the 24th of December for the quarter to Lady Day next, in anticipation of the close of the financial year. During the financial year commencing on the 1st of April next, and thereafter until further notice, water-rates will be collected half yearly during the periods ending the 30th of September and the 31st of March respectively; the rates being payable in advance by equal quarterly payments at Lady Day, Midsummer, Michaelmas, and Christmas.

Incandescent Gas-Burners for Hospital and Office Lighting.—In the course of an article on the "Lighting, Heating, and Ventilation of Public Buildings" which appears in the current number of the "Local Government Journal," Mr. G. H. Bibby says: "With regard to the artificial lighting of hospital wards especially, I consider that the Welsbach light is far superior to anything else, for it solves the whole problem of sufficiently lighting up all parts of the wards without that injury to the eyes that is experienced with electric lighting. It is a common occurrence to find in offices lighted by electricity the burners covered with green or other paper for the purpose of reducing the unbearable brightness, especially in offices where the inmates are engaged in working over drawings, where the glare of the white paper becomes quite unbearable. It has been specially adapted for hospitals. Pendants for operating-rooms, with enamelled-line reflecting shades, are supplied, which ensure a full concentration of light without risk of breakages of glass."

A little model of a gas-oven door, which the Richmond Gas Stove and Meter Company, Limited, show, makes a serviceable paper weight for the desk, and also, at the same time, illustrates the beautiful finish that can be given to gas-fires by the Company's system of "Porcellanite" enamelling, in which they offer the choice of eight colours.

To the large number of members and officials of public bodies who are interested in the law and practice of assessments, a little pamphlet just published, at the price of 1d., by Mr. S. Edgecumbe Rogers, of Farringdon Street, E.C., on the Valuation Bill, 1904, will probably furnish interesting and instructive reading. It consists of some criticisms of the Bill by a leading expert, which originally appeared in the "Local Government Journal."

Messrs. J. S. Fairfax and Co., of Essex Street, Strand, have sent us a pamphlet descriptive of their system of direct driving from high-speed shafts at low speeds. It includes new types of reduction gear to drive directly from a motor shaft at one of six different ratios; pulley shafts of two, three, or four pulleys, equal in diameter, each revolving at a different forward or reverse speed to its neighbour; and a compact pulley-block, convertible to a self-sustaining hand crane.

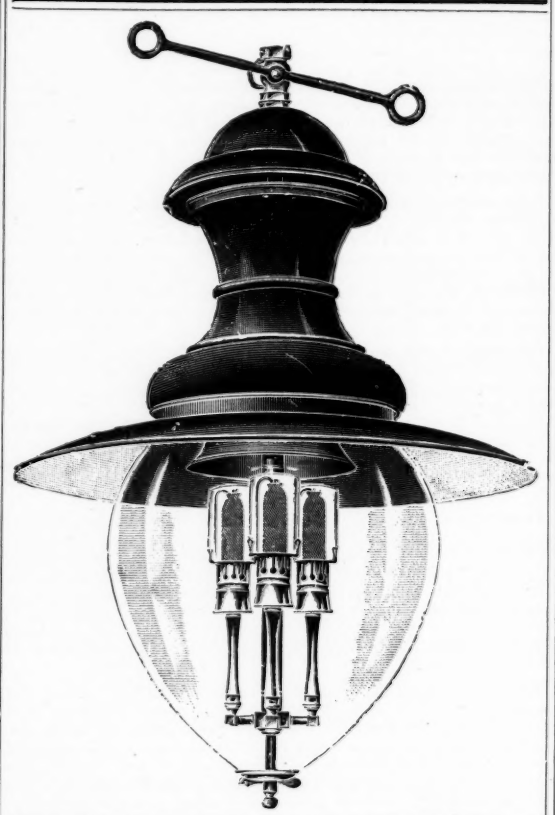
A striking instance of what may be accomplished by enterprise in pushing the sale of gas is afforded at Clayton West, in Yorkshire. In July last year the gas-works were acquired by Mr. A. F. Goodson, formerly Manager of the Heckmondwike Gas Company. Since then the number of consumers has more than doubled; while the consumption is now three times as much as it was a year ago. The reduction of 6d. per 1000 cubic feet, the supply of free gas-stoves, and the virtual abolition of meter-rents have all contributed to the improved state of affairs.

On the recommendation of the Water Committee, the Hornsea Urban District Council have decided to arrange with Mr. G. F. Murray for a trial test of an air-lift pumping installation, on condition that if the test is not in every way satisfactory, or if the Council are unable to obtain the sanction of the Local Government Board to borrow money for the purpose, the plant is to be removed by Mr. Murray upon payment by the Council of a sum not exceeding £97 for all expenses incurred. It was the successful operation of the system at Leigh that induced the Committee to recommend its adoption at Hornsea.

In the Dumfries Sheriff Court, on Friday last, Thomas Ranken, W.S., of Edinburgh, was charged with a contravention of the Petroleum Act, 1871, by having more than 28 lbs. of carbide of calcium stored in an unlicensed building. It was stated that, in connection with an installation of acetylene gas, the accused had as much as 11 cwt. of carbide stored in an outhouse, remote from the mansion house. The installation had been fitted up by a Glasgow firm, from whom a letter was produced stating that they took the whole blame upon themselves, for not having informed Mr. Ranken that a licence was necessary. Sheriff Campion imposed a fine of £1. A similar penalty was incurred by Peter Crawford, of Dorgarvel, who, it was said, had kept 4 cwt. of carbide in a building without having obtained a licence.

In replying to the toast of the "Maidstone Gas Company," at the recent annual dinner of the employees in the fittings department, Mr. Henry Smythe, the Engineer and Manager, drew attention to the fact that he was addressing shareholders as well as employees, which was most gratifying to him as their Manager. But he took it that the toast was a testimony of their good feeling towards the Directors, and their desire for the prosperity of the Company in the future. He was pleased to think that the scheme introduced by their Chairman, Mr. George Marsham, for the benefit of the workmen, had been so largely taken advantage of; there being at present £400 taken up by the employees. This, he thought, was a step in the right direction. The business of the Company was still increasing, even though they had now an active competitor in the shape of the electric light; and from the way in which they had received the toast, he had no hesitation in saying that, by the co-operation of the officials and workmen, they would make further progress in the future.

Improved Lanterns.



Exclusive Features of our Improved Veritas and Veritas-Celestra Lanterns.

1. No fixing screws on exposed parts of cases thus obviating the chipping of the enamel and consequent rusting at these points.
2. New fixed Patent Lever Globe Carriers ensuring a quick and reliable fixing of the Globes.
3. Our new extra wide opening Globes (Regd.) are interchangeable with the ordinary small opening Globes; they facilitate the removal of Burners, cleaning, &c.
4. Patent Globe lowering Fitting. By means of this a considerable saving in labour is effected on the part of attendant.

Write for Illustrated List, post free.

Inquiries from Lighting Authorities invited.

FALK, STADELMANN, & CO., LIMITED,

83, 85, & 87, Farringdon Road, LONDON, E.C.

The Directors of the Newcastle and Gateshead Gas Company have resolved, subject to audit, to recommend the payment for the half year ended Dec. 31 of dividends at the rate of 4 per cent. per annum upon the preference stock, and 4⅝ per cent. per annum upon the ordinary stock. These are the full statutory dividends; and that upon the ordinary stock is 2s. 6d. per cent. per annum more than for the corresponding period of 1903.

At the last meeting of the Smethwick Town Council, under the presidency of the Mayor (Alderman G. Bowden) a discussion arose as to the desirability of opening sub-offices for the payment of gas accounts in the outlying districts of the borough, to avoid the inconvenience caused at present to consumers through having to walk long distances to the central offices at the Public Buildings. It was pointed out that in Birmingham and other large towns sub-offices had been opened with satisfactory results. Alderman Lones (the Chairman of the Gas Committee) said he considered it an excellent scheme; and he promised that people who wished to pay their accounts in their own locality should have the opportunity of doing so. He intimated his intention of bringing the matter before the Gas Committee.

The Cannock, Hednesford, and District Gas Company have placed an order with Messrs. Robert Dempster and Sons, of Elland, for a steel tank and a telescopic gasholder, as recently advertised for in our columns.

The estimate of the Lighting Committee of the Newcastle Corporation of the cost of lighting the streets for the ensuing year is £26,357, as against £22,622 last year. This large increase is mainly owing to the incorporation of Walker, Benwell, and Fenham.

Mr. William Brothers, of Prestwich, the Managing Director of Brothers Chemical Manufacturing Company, Limited, of Rawtenstall, has patented a process for dealing with the waste heaps, principally composed of sulphate of lime, which are to be seen at many chemical works. It consists in re-crystallizing the waste into a white cement, which gives a perfectly smooth surface, with a high polish, and just sufficiently porous to take paint. It is stated that experiment has shown that the cement requires 50 per cent. less paint than any other, because of its smooth surface and its less porous nature. Other advantages claimed are that it takes less time to spread, with a corresponding saving in wages; and it sets hard, takin g a brilliant polish.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY. Portsea Island Gas Company. Applications by Feb. 8.
ASSISTANT GAS ENGINEER for Peru. Lee and Nightingale, Liverpool.
MANAGER. Ripley Gas-Works. Applications by Jan. 30.
ASSISTANT MANAGER (with capital preferred) for Commercial Undertaking. No. 4323.
TRAVELLERS OR REPRESENTATIVES. No. 4321.
CLERK OF WORKS. Preston Water Department. Applications by Jan. 31.
DRAUGHTSMAN AND ANALYST. Huddersfield Gas Department. Applications by Feb. 7.
STOREKEEPER. No. 4327.
MAINLAYER AND JOINER. Gas and Water Works Supplies and Construction Company, Cannon Street, E.C.
CANVASSER. No. 4322.

Situations Wanted.

GAS ENGINEER. No. 4329.
ENGINEER AND MANAGER. No. 4320.
METER INSPECTOR. No. 4330.
GAS-FITTER, &c. No. 4331.

Plant, &c., Wanted.

GAS-WORKS (Purchase or Lease). No. 4328.
STATION METER. Sutton-in-Ashfield Gas Department.

Company Meetings.

BARNSTAPLE GAS COMPANY. Barnstaple. Feb. 11, Twelve o'clock.
GASLIGHT AND COKE COMPANY. Chief Office. Feb. 3, Twelve o'clock.
HORNSEY GAS COMPANY. London Office. Feb. 10, 3.30 o'clock.
SOUTH METROPOLITAN GAS COMPANY. Cannon Street Hotel. Feb. 8, Two o'clock.
SOUTH SUBURBAN GAS COMPANY. Albion Tavern. Feb. 10, Three o'clock.

Business for Disposal.

GAS LIGHTING AND CHEMICAL ENGINEERING. Hill, W., Gracechurch Street, E.C.

Loans on Mortgage.

Derwent Valley Water Board.

Stocks and Shares.

ASCOT GAS COMPANY. Jan. 31.
BOMBAY GAS COMPANY. Jan. 31.
CROYDON GAS COMPANY. Feb. 1.
GRAYS GAS COMPANY. Jan. 31.
HARTLEPOOL GAS AND WATER COMPANY. Feb. 9.
HYTHE AND SANDGATE GAS COMPANY. Jan. 31.
NORTH MIDDLESEX GAS COMPANY. Jan. 31.
SOHAM GAS COMPANY. Jan. 31.
SOUTH SUBURBAN GAS COMPANY. Jan. 31.
SUNBURY GAS COMPANY. Jan. 31.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 15.

TENDERS FOR

Coal and Cannel.

ALTRINCHAM GAS COMPANY. Tenders by Feb. 6.
NELSON GAS DEPARTMENT. Tenders by Feb. 15.

Fire-Clay Goods.

SALFORD GAS DEPARTMENT. Tenders by Feb. 2.

Gasholder.

WOKING GAS COMPANY. Tenders by Feb. 11.

Gasholder Tank (Steel).

WOKING GAS COMPANY. Tenders by Feb. 11.

General Stores.

STOCKTON-ON-TEES CORPORATION. Tenders by Feb. 10.

Ironmongery and Brass Fittings.

NELSON GAS DEPARTMENT. Tenders by Feb. 15.

Lighting Public Streets.

OULTON BROAD DISTRICT COUNCIL. Tenders by Feb. 4.

Oxide of Iron.

LEITCH AND CO., Huddersfield.

Pipes, &c.

SHEFFIELD GAS COMPANY. Tenders by Feb. 3.

Purifier.

TODMORDEN GAS DEPARTMENT. Tenders by Feb. 13.

Retort House.

WOKING GAS COMPANY. Tenders by Feb. 11.

Sulphuric Acid.

NELSON GAS DEPARTMENT. Tenders by Feb. 15.

Tar and Ammoniacal Liquor.

CRAYS GAS COMPANY. Tenders by Jan. 31.
NELSON GAS DEPARTMENT. Tenders by Feb. 15.

Well Boring.

WIDNES WATER DEPARTMENT. Tenders by Feb. 7.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 219.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
530,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21—22	+½	4 15 5
100,000	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	Nov. 11	6½	Bombay, Ltd.. . . .	6—6½	..	5 0 0
140,000	5	,,	6½	Do. New, £4 paid	4½—5	..	5 4 0
50,000	10	Aug. 31	14	Bourne-) 10 p.c. .	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas) B 7 p.c. .	16—17	..	4 2 4
53,200	10	,,	6	and Water) Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	250 - 255	..	4 14 1
300,000	,,	,,	9	Do. New . . .	190—195	..	4 12 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	..	3 14 1
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb. .	105—108	..	3 14 1
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	228—233	..	4 14 5
246,320	,,	,,	8	Do. A. Ord. Stk. .	168—173	..	4 12 6
460,000	20	Sept. 29	10	British	41—42	..	4 15 3
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	117—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c. .	92—96	..	4 13 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
150,000	20	July 14	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	16½—16¾	..	5 19 5
100,000	10	Oct. 27	4½	Do. 4½ p c Pref.. .	9½—10	+¼	4 10 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	+1	5 11 1
50,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,375,000	Stk.	Aug. 31	5/16	Commercial 4 p c Stk. .	117—120	..	4 6 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—116	..	4 6 2
450,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6½	Continental Union, Ltd.	118—121	+1	5 7 5
200,000	,,	,,	7	Do. 7 p c. Pref.	140—145	..	4 16 7
424,070	Stk.	Aug.	5	Derby Con. Stk. . . .	123—125	+1	4 2 0
55,000	,,	Jan. 3	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,690	10	July 14	11	European, Ltd. . . .	21—22	+½	5 0 0
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	+½	5 6 6
15,243,200	Stk.	Aug. 12	4 4/16	Gas-) 4 p.c. Ord. . .	100—101	—3	4 7 1
2,600,000	,,	,,	3½	light) 3½ p.c. max. . .	93—95	..	3 13 8
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	110—112	..	3 11 5
4,193,975	,,	Dec. 15	3	Coke) 3 p.c Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	100—103	..	4 17 1
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	16—17	..	6 9 5
3,800,000	Stk.	Nov. 11	10	Imperial Continental .	211—213	—1	4 13 11
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	118—123	..	4 17 7
561,000	Stk.	Aug. 31	10	Liverpool United A . .	222—224	..	4 9 3
718,100	,,	,,	7	Do do. B .	160—162	..	4 6 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	Dec. 30	4	L'rpool Unit'd Deb. Stk.	107—109	+1	3 13 5
75,000	5	Dec. 15	5	Malta & Medn., Ltd. .	4—4⅛	..	5 11 1
560,000	100	Oct. 1	5	Met. of) 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd. . .	10—11	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	109—110	—½	4 1 10
406,025	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	90—91	..	3 16 11
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	1	,,	7	Do. 7 p.c.	13⅜—14⅜	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	147—150	..	5 6 8
600,000	5	Sept. 15	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6⅔	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord. . . .	5½—6	+¼	4 3 4
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4½—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	94—96	+1	4 3 4
851,070	10	Oct. 13	7	River Plate Ord. . . .	12—12½	+¼	5 12 0
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	12—12½	..	4 16 0
70,000	50	Jan. 3	5	Do. 5 p.c. Deb. .	52—54	..	4 12 7
135,000	Stk.	Sept. 15	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	133—135	..	4 1 6
1,832,700	,,	Jan. 13	3	Do. 3 p.c. Deb.	88—90*	..	3 6 8
575,020	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—130	..	3 16 11
112,533	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	130—135*	..	3 14 1
502,310	Stk.	Nov. 11	5	Southampton Ord. . .	106—109	+1½	4 11 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p.c. .	123—128	..	4 17 8
325,520	,,	,,	4¼	and) B 3½ p.c. .	97—102	..	4 13 2
115,000	,,	Dec. 15	4	Edmonton) 4 p.c. Deb.	102—105	..	3 16 2
182,380	10	,,	8	Tuscan, Ltd.	8¾—9¼	..	8 13 0
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
30,000	Stk.	Aug. 31	7½	Wands-) A 5 p.c. . .	160—165	..	4 13 11
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	133—138	..	4 10 7
51,293	,,	,,	5 7/16	and) C 3½ p.c. . .	110—115	..	4 13 6
57,564	,,	Dec. 30	3	Putney) 3 p.c. Deb. Stk.	77—82	..	5 13 2
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord. .	101—103	..	4 17 1
85,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—127	..	3 18 9
160,000	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107—106	..	3 15 6

Prices marked * are Ex div.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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CHARGING MACHINES—See Advt. in Jan. 10.
EXHAUSTING MACHINERY—See Advt. in this week's issue.
SATURATORS—See Advt. in next week's issue.

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Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

ENGINEER and Manager of Borough Gas-Works is open to an Engagement elsewhere. Slot consumption doubled, general consumption 24 per cent. increase in Two Years. Works cost per 1000 cubic feet sold 33 per cent. less.
Address No. 4320, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Engineer, with over 20 years Practical Experience, is prepared to accept ENGAGEMENT as Engineer, Manager, or Secretary.
Apply, by letter, to No. 4329, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STOREKEEPER wanted. Must have had fairly wide Experience and be a good and quick Writer. Wages 30s. per week.
Apply, with *copies* of not more than Two recent Testimonials, to No. 4327, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Gas and Water-Works Supplies and Construction Company, Limited, require a good Water MAIN LAYER and JOINTER on a large Contract, either piece work or weekly.
State Experience, &c., and Wages and Price, to 99, CANNON STREET, E.C.

ENERGETIC and up-to-date Manager required to undertake control of a Gas-Works producing 24 Million cubic feet per Annum.
Applications, stating Age, Experience, and Salary required, must be sealed and endorsed "Gas Manager," accompanied with Three *copies* of recent Testimonials, and delivered not later than Jan. 30 to the SECRETARY, Gas Company, Ripley, DERBY.

TRAVELLERS or Representatives calling upon the Gas Trade and Gas Companies wanted to take up on Commission First-Class Specialities of the highest efficiency, such as Indoor and Outdoor Lanterns, Incandescent Burners, Mantles, &c. Liberal Terms to gentlemen who will push them with energy.
Apply, by letter, giving References, and stating Experience and district covered, to No. 4321, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Gas Engineer wanted for Peru. Age Limit 35. Must have thorough Practical Acquaintance with all branches of Gas Manufacture and Distribution, including Water Gas and use of Petroleum; also knowledge of Electric Lighting desirable. Three Years' engagement. Salary to commence £250 per Annum. Unfurnished Rooms, Water, Coals, and Gas free.
Write, with Testimonials, to "P39," care of LEE AND NIGHTINGALE'S Advertising Offices, LIVERPOOL.

COUNTY BOROUGH OF PRESTON.

WATER-WORKS EXTENSION.

THE Corporation require the services of a CLERK OF WORKS to act under the direction of the Borough Surveyor during the carrying out of the Enlargement of their Reservoirs.

Candidates must have a wide Experience in Water-Works and must also be able to Survey, Set out Works, and Level.

The person appointed will be required to give his whole time to the duties of the Office.

Applications, endorsed "Clerk of Works," stating Age, Salary required, previous Experience, and Qualifications, &c., accompanied by not more than Three recent Testimonials, must be sent to the undersigned not later than Tuesday, the 31st inst.

HENRY HAMER,
Town Clerk.

Town Hall, Preston, Jan. 18, 1905.

ROBERT DEMPSTER & SONS, Ltd., Contractor for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

WANTED, by a Gas Company in the North of England, an active Young Man as CANVASSER. Preference will be given to one having a practical knowledge of Gas Apparatus and who is able to prepare Estimates for improved Gas Lighting, Heating, Cooking, &c.

Apply, stating Age, previous Experience, and Salary required, to No. 4322, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A MANUFACTURING Concern closely connected with the Gas Industry, introducing Specialities of the most superior types and having excellent prospects, requires an ASSISTANT-MANAGER, with good Technical and Commercial knowledge. Liberal terms offered to suitable gentleman. One who can invest £2500 to £3000 preferred. Good security given for investment. First-class References given and strictest investigation offered.

Address No. 4323, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF HUDDERSFIELD.
(GAS DEPARTMENT.)

APPLICATIONS are invited for the post of DRAUGHTSMAN and ANALYST. Salary £100 per Annum.

For Particulars of duties, apply to Mr. Edward A. Harman, M.Inst.C.E., Engineer, Gas-Works, Huddersfield.

Applications, stating Experience, accompanied by copies of not more than Three recent Testimonials, must be delivered at the Town Clerk's Office, addressed to the Town Clerk, Huddersfield, and endorsed "Draughtsman and Analyst," not later than Tuesday, the 7th day of February, 1905.

Canvassing members of the Council will be deemed a disqualification.

By order,
J. HENRY FIELD,
Town Clerk.

Town Hall, Huddersfield,
Jan. 20, 1905.

PORTSEA ISLAND GASLIGHT COMPANY, PORTSMOUTH.

APPOINTMENT OF SECRETARY.

THE Directors of the above Company are prepared to receive APPLICATIONS for the position of SECRETARY, at a salary of £250 per Annum. In addition, the successful candidate will receive the appointment of Secretary to the Portsea Island Gas-Fittings Company, Limited, at a salary of £50 per Annum.

Applicants must be acquainted with the office routine of a public company. No application will be considered from anyone who has not had such Experience.

Applications, to be accompanied by not more than Three Testimonials of recent date, addressed to the Chairman of the Company and endorsed "Application for Secretaryship," and sent to my Office, arriving not later than first post on Wednesday, February 8, 1905. Age 30 to 40.

The person appointed must devote the whole of his time to the duties of the office.

By order,
J. D. ASHWORTH,
Engineer and General Manager.

Engineer and General Manager's Office,
Gas-Works, Flathouse, Portsmouth,
Jan. 20, 1905.

WANTED to Purchase small Gas- Works, or Lease with option of Purchase.

Full Particulars to No. 4328, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council require a second- hand STATION GAS-METER, to pass from 20,000 to 25,000 cubic feet of Gas per hour.

Further Particulars may be obtained on application to the undersigned.

THOMAS ROBINSON,
Manager.

Gas-Works, Sutton-in-Ashfield,
Jan. 21, 1905.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO GAS ENGINEERS AND OTHERS.

FOR SALE, as a going concern, the Old- Established business of H. Greene and Sons, Limited, Gas Lighting Engineers and Contractors, Chemical Engineers, and Manufacturers, Surrey Engineering Works, Blackfriars.

For full Particulars apply to the RECEIVER AND MANAGER, Mr. J. Walter G. Hill (Messrs. Abbott, Deeley, Hill, AND Co.), 61, Gracechurch Street, LONDON, E.C.

CRAYS GAS COMPANY.

TENDERS FOR TAR.

THE Directors invite Offers for the surplus TAR produced until Dec. 31, 1905.

Particulars will be forwarded on application to the undersigned.

Tanks can be filled on rail.

Tenders, endorsed "Tender for Tar," and addressed to the undersigned, must be delivered not later than Nine a.m. on Tuesday, Jan. 31 inst.

W. B. MIMMACK,
Secretary.

Gas-Works, St. Mary Cray,
Kent, Jan. 11, 1905.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of FIRE-BRICKS, RETORTS, &c., for their various Works.

Full Particulars may be obtained on application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 2nd of February, 1905.

L. C. EVANS,
Town Clerk.

Town Hall, Salford, Jan. 18, 1905.

WOKING DISTRICT GAS COMPANY.

TENDERS are invited for the supply and erection of a RETORT HOUSE constructed of Steel Stanchions, Roof, and Girders, and covered with corrugated iron.

Specification and Drawings may be seen, and full Particulars obtained from Messrs. W. A. Valon and Son, 140, Temple Chambers, E.C.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in, endorsed "Tender for Retort-House," on or before Saturday, the 11th of February, 1905, addressed to the undersigned.

B. DENNETT HOLROYD,
Secretary.

5 and 6, Great Winchester Street, E.C.

WOKING DISTRICT GAS COMPANY.

TENDERS are invited for the supply of a Steel GASHOLDER and Steel TANK and its erection at the Woking Gas-Works.

Specification and Drawings may be seen and full Particulars obtained from Messrs. W. A. Valon and Son, 140, Temple Chambers, E.C.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in, endorsed "Tender for Gas-holder," on or before Saturday, the 11th of February, 1905, addressed to the undersigned.

B. DENNETT HOLROYD,
Secretary.

5 and 6, Great Winchester Street, E.C.

OULTON BROAD URBAN DISTRICT COUNCIL.

THE Oulton Broad Urban District Council, being desirous to Light certain of the Public Streets in their area, invite practical SUGGESTIONS from Contractors, Tradesmen, and Others.

Full Particulars must be given as to Illuminant, Candle-Power, Cost of Installation, Maintenance, and terms upon which experimental lamps can be supplied for a month's trial.

Electrical Current is supplied by a private firm in the area; but there is no Gas available.

Communications to be made to me, the undersigned, on or before the 4th day of February next.

Dated this 17th day of January, 1905.

CECIL G. TAYLOR,
Clerk.

Waveney Chambers, Lowestoft.

WIDNES CORPORATION WATER-WORKS.

TO BORING AND WELL-SINKING CONTRACTORS.

THE Widnes Corporation invite Tenders for sinking Two 32-inch BOREHOLES in the new red sandstone at their Stocks Well Pumping-Station.

Copies of Specification and Plans may be had on application to the Engineer, Mr. Isaac Carr, M.Inst.C.E., Widnes, on payment of Three Guineas, which will be returned on receipt of a *bona-fide* Tender.

Tenders, endorsed "Boring," must be addressed to the Chairman of the Gas and Water Committee and delivered at the Town Hall, Widnes, on or before noon on Tuesday, the 7th of February, 1905.

By order,
H. S. OPPENHEIM,
Town Clerk.

Widnes, Jan. 16, 1905.

BOROUGH OF STOCKTON-ON-TEES.

ANNUAL SUPPLIES.

THE District Fund, Gas, Quay, and Electricity Committees of the Stockton-on-Tees Corporation invite TENDERS for the several ARTICLES and STORES required by them for the Year ending March 31, 1906.

Forms of Tender, Conditions of Contract, and all Information may be obtained of the Borough Engineer, Gas Engineer, Quay Manager, and Electric Light Engineer.

Persons desirous of Tendering should state the Articles they desire to offer.

Tenders, endorsed "Stores," and also marked for the particular Committee for which they are intended, on Printed Forms only, to be delivered to me not later than the 10th of February 1905.

The lowest or any Tender not necessarily accepted, and no Guarantee will be given as to quantity required.

By order,
ARTHUR B. CROSBY,
Town Clerk.

Stockton-on-Tees, January, 1905.

TO PIPE FOUNDERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the following Cast-Iron Spigot and Socket PIPES—viz:

200 2-inch PIPES in 6 feet lengths.
500 3-inch PIPES in 9 feet lengths.
1500 4-inch PIPES in 9 feet lengths.
200 6-inch PIPES in 9 feet lengths.

The Pipes must be cast vertically. The price to include delivery to Sheffield, which must be made in about Two Months from receipt of order.

Tenders, addressed to the undersigned, to be sent in not later than the first post on Friday, Feb. 3, 1905.

The Directors do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street,
Sheffield, Jan. 13, 1905.

TODMORDEN CORPORATION.
(GAS DEPARTMENT.)

NEW PURIFIERS.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply and fixing complete at their Millwood Works, two new PURIFIERS, 25 feet square, on Green's principle, with Centre Valve complete.

Full Particulars and Specification can be seen at the Gas-Works, Millwood, Todmorden, on application to the Engineer, Mr. Hy. Hawkins.

Tenders to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, on or before the 13th of February.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
HY. HAWKINS,
Engineer and Manager.

BOROUGH OF NELSON.

SUPPLY OF GENERAL REQUIREMENTS AND SALE OF SURPLUS TAR.

THE Gas Committee invite Tenders for the supply of the following requirements during the Twelve Months ending the 31st of March, 1906:

(a)—GAS COAL.
(b)—SULPHURIC ACID.
(c)—IRONMONGERY.
(d)—BRASS FITTINGS;

and also for the purchase of the surplus TAR produced at their Nelson and Brierfield Works during the Twelve Months ending the 31st of March, 1906.

Form of Tender for each item, together with full Particulars, may be obtained on application to Mr. A. J. Hope, Engineer, Gas-Works, Nelson.

Sealed Tenders, duly endorsed, must be sent to the undersigned not later than Wednesday, the 15th day of February, 1905.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson, Jan. 21, 1905.

ALTRINCHAM GAS COMPANY.

COAL AND CANNEL CONTRACTS.

TENDERS are invited for best Screened GAS COAL and CANNEL for One, Two, Three, or Four Years, commencing the 1st of July, 1905.

Estimated quantities required per Year: Coal, 12,000 Tons; Cannel, 4000 Tons.

Deliveries to be free at Altrincham Railway Station and as required.

Sealed Tenders, endorsed "Tender for Coal" or "Cannel," stating the Description of each, the Pits from which they are to be raised, the amount proposed to be supplied, and Cash Terms for monthly payments, to be sent addressed to the undersigned so as to be received not later than Twelve o'clock noon on Monday, the 6th day of February, 1905.

The Directors do not bind themselves to accept the lowest or any Tender; but the person or persons whose Tender may be accepted will be required to execute an Agreement for the due performance thereof.

No Special Form of Tender is required or supplied.

F. R. B. LINDSELL,
Secretary.

Gas Office, Moss Lane,
Altrincham, Jan. 19, 1905.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 10th day of February, 1905, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect Two Directors and One Auditor in the place of those retiring by rotation, and for General Purposes.

NOTICE IS HEREBY GIVEN, that an EXTRAORDINARY MEETING of the Proprietors of the South Suburban Gas Company will be held at the Albany Tavern, Aldersgate Street, London, E.C., on Friday, the 10th day of February next, at 3.30 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to alter the provisions of the Acts relating to the South Suburban Gas Company with respect to the Illuminating Power of Gas supplied by them and the Testing of Gas, and for other purposes."

At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.

Dated this 27th day of January, 1905.

The TRANSFER BOOKS WILL BE CLOSED from the 27th day of January until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Jan. 27, 1905.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of the Gaslight and Coke Company will be held at the Chief Office of the Company, Horseferry Road, Westminster, S.W., on Friday, the 3rd day of February next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of office in compliance with the Company's Acts or Schemes of Amalgamation.

By order,
HENRY RAYNER,
Secretary.

Chief Office, Horseferry Road,
Westminster, S.W., Jan. 16, 1905.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby also Given, that, pursuant to the Standing Orders of both Houses of Parliament, an EXTRAORDINARY MEETING of the Proprietors of the Gaslight and Coke Company will be held at the Chief Office of the Company, Horseferry Road, Westminster, S.W., immediately after the Half-Yearly Ordinary General Meeting to be held at the said Office on Friday, the 3rd day of February next, at Twelve o'clock (noon), when a Bill now before Parliament, intituled "A Bill to amend the Acts relating to the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies with regard to the Testing of Gas, Procedure for Forfeitures, and otherwise," will be submitted to the Proprietors then present, either in person or by proxy, for their consideration and approval.

By order,
HENRY RAYNER,
Secretary.

Chief Office, Horseferry Road,
Westminster, S.W., Jan. 16, 1905.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that an EXTRAORDINARY MEETING of the Proprietors of the South Metropolitan Gas Company will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 8th day of February next, at 2.30 o'clock in the afternoon, or so soon thereafter as the Business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the provisions of the following Bills now before Parliament—that is to say, Firstly: A Bill intituled "A Bill to amend the Acts relating to the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies with regard to the Testing of Gas, Procedure for Forfeitures, and otherwise; Secondly, A Bill intituled "A Bill to Provide for the Retirement of the Gas Referees appointed in relation to the Testing of Gas supplied in the Metropolis, to empower the South Metropolitan Gas Company to Purchase Lands, and for other purposes.

At such Meeting both the said Bills will be submitted for the consideration and approval of the Proprietors.

Dated this 21st day of January, 1905.

By order,
FRANK BUSH,
Secretary.

Offices: 709, Old Kent Road,
London, S.E.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 10th day of February, 1905, at Half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors, elect Two Directors and an Auditor, and to transact the Business of an Ordinary General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 28th of January to the 10th of February, 1905, both days inclusive.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

Offices: 63, Chancery Lane,
London, W.C., Jan. 24, 1905.

BARNSTAPLE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Bridge Hall, Barnstaple, on Saturday, the 11th day of February, 1905, at Twelve o'clock noon, to receive the Report of the Directors and the Accounts for the Year ended the 31st day of December last, to declare Dividends, to elect Directors and an Auditor, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 28th of January to the 11th of February, both days inclusive.

By order of the Board,
F. L. SCHOFIELD,
Secretary.

Offices: 15, Cross Street, Barnstaple,
Jan. 16, 1905.

THE Derwent Valley Water Board is prepared to receive a limited amount of money upon Mortgage at £3½ per cent. per annum either for a term of years, not exceeding seven, or repayable at six months' notice from either party.

The Derwent Valley Water Board was constituted by Parliament in 1899 to supply water to the towns of Derby, Leicester, Nottingham, and Sheffield, and the monies required for carrying out the necessary Works are, by the powers of the Derwent Valley Water Acts 1899 to 1904, secured upon the Revenues and Rates of the said Towns in due proportion.

Applications to be sent to Mr. W. Gill Hodgson, Accountant to the Board, Bamford, via Sheffield.

By order,
O. B. STEWARD,
Clerk to the Board.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

GAS STOCKS AND SHARES
IN THE
NORTH MIDDLESEX GAS COMPANY.
ASCOT DISTRICT GAS COMPANY.
GRAYS GAS COMPANY, LIMITED.
SOUTH SUBURBAN GAS COMPANY; BOMBAY GAS COMPANY, LIMITED; SUNBURY GAS COMPANY; HYTHE AND SANDGATE GAS COMPANY; SOHAM GAS COMPANY.

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS, at the Mart., E.C., on Tuesday, the 31st of January, at Two o'clock, by Order of the Executor of Mrs. Williams, deceased.

Particulars of Messrs. CHURCH AND SONS, Solicitors, 51 and 52, FENCHURCH STREET, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

To Trustees and Others.—By order of the Directors of

THE CROYDON GAS COMPANY.

SALE OF £10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

HOOKER and WEBB have received instructions to SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, the 1st of February, 1905, at Two o'clock precisely, in 114 Lots,

£10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK

of the Croydon Gas Company, in lots of from £25 to £100 Stock each. The Reserve and Insurance Funds at Midsummer last amounted to £44,522 8s. 11d.; the paid-up Ordinary Capital at that date was £310,000, whereas the Debenture Stock now amounts to only £45,000, thus showing that the stock offered is a security of the highest class.

Particulars and Conditions of Sale may be had of the SECRETARY, at the Offices of the Company, Katharine Street, CROYDON; at the MART, E.C.; and of the AUCTIONEERS, 4, High Street, CROYDON.

Telephone No. 122 Croydon.

HARTLEPOOL GAS AND WATER COMPANY.

IMPORTANT SALE OF GAS AND WATER STOCK.

TO BE SOLD by Auction, at the Company's Offices, Middleton Road, West Hartlepool, on Thursday, the 9th of February, 1905, at 2.30 p.m. precisely,

MR. JOHN HUNTER, AUCTIONEER,

£10,000

(Nominal) of the NEW ORDINARY STOCK,

(Maximum Dividend, Five per cent.) authorized to be created and issued under the powers contained in the Company's Act, 1898.

The above Stock will be entitled to Dividend from the 3rd of March next, if then fully-paid up, and will be registered in the name of the purchaser without charge.

A Deposit of 10 per cent. will be required to be paid at the time of Sale, and the remainder on or before the said 3rd day of March.

The Stock will be offered in Lots of £100 each.

By order of the Directors,
W. SCOTT,
Secretary.

Hartlepool Gas and Water Company's Offices,
West Hartlepool, Jan. 12, 1905.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Wednesday, the 15th of February, 1905, at Two o'clock in the afternoon prompt.

MR. ATKINSON GIBSON, AUCTIONEER,

£15,000

(Nominal) of ADDITIONAL ORDINARY CAPITAL STOCK,

(Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1905, and be registered in the name of the Purchaser free of charge.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1905.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL."
(GREEN CLOTH, GILT LETTERED).
Price 2s. each.

Now Ready, pp. 584 and XVI. 251 Illustrations.
F'Cap. Quarto, Price 18s. net (Post Free).

THE SEVENTH EDITION OF
NEWBIGGING'S HANDBOOK
FOR
GAS ENGINEERS AND MANAGERS
(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.

In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the Value of the book as a Work of Reference.

Orders may be sent through any Bookseller, or direct to the Publisher,
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

COLLIERY MANAGER'S POCKET BOOK AND DIARY FOR 1905.
Prices: Cloth, 2s.; Roan, Gilt, 3s.; Russia Leather, 4s. 6d.
TO BE OBTAINED FROM THE
COLLIERY GUARDIAN CO., LIMITED,
30 & 31, Furnival Street, Holborn, LONDON, E.C.

Now Ready. Price 5s. 6d. Post Free.
REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1904.
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER," Telephone 1806.

Gas Companies are solicited to try Samples of the
MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
Prices and Analysis on application.
The MIRFIELD (GAS-COAL) COLLIERIES CO.,
RAVENSTHORPE, NEAR DEWSBURY.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

THE
"ROTARY"
STATION METER.
Efficiency
Demonstrated.
APPLY—
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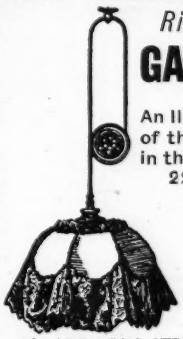
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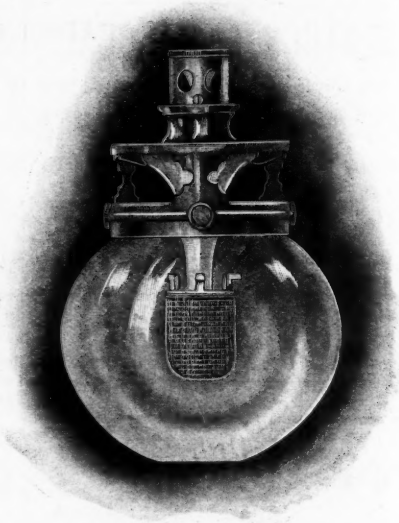

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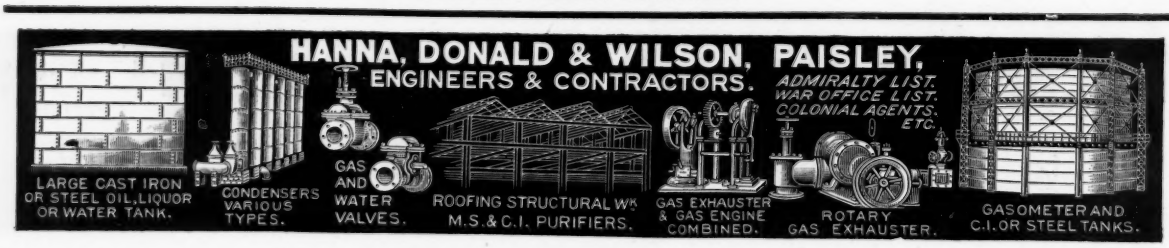
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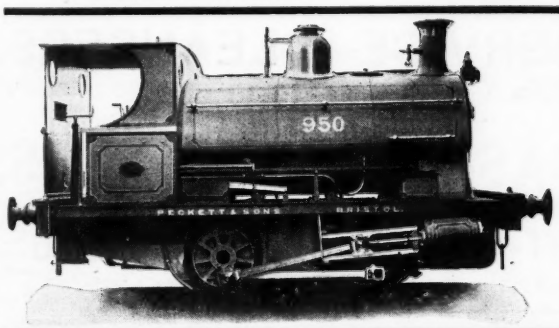

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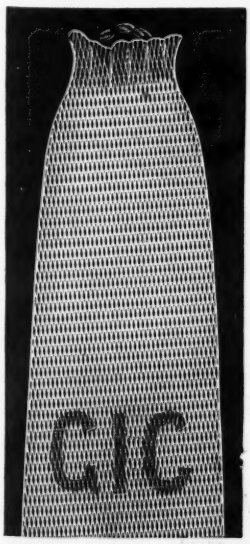

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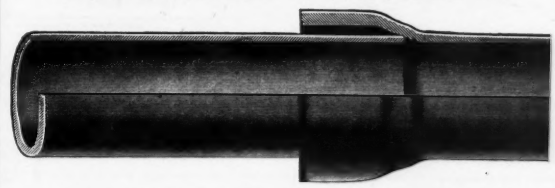

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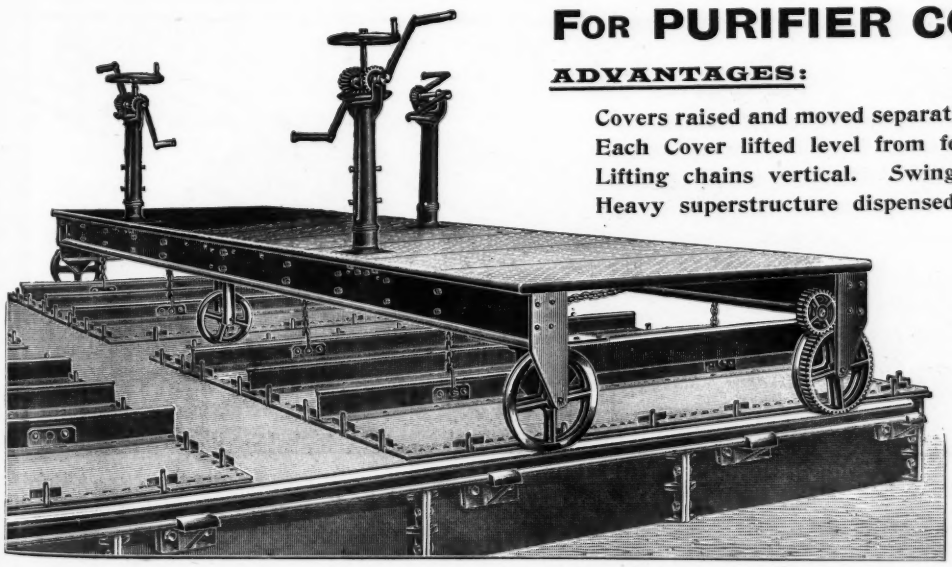

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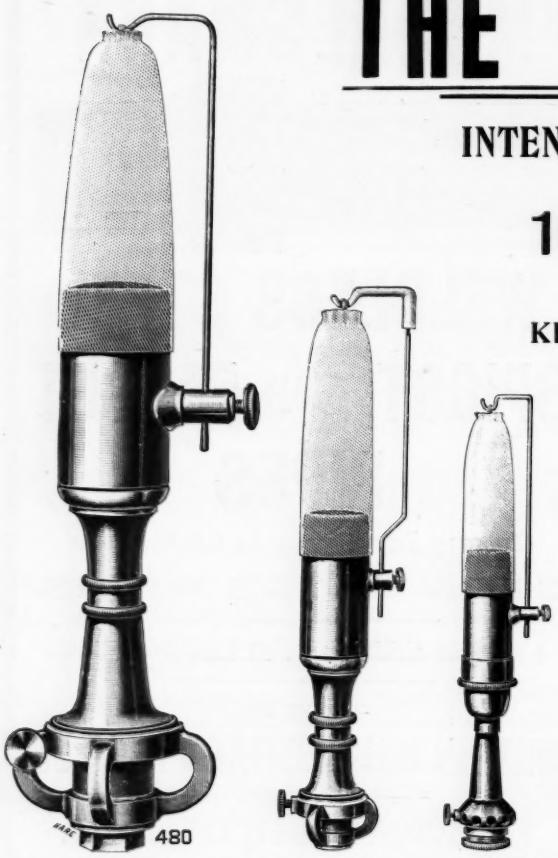

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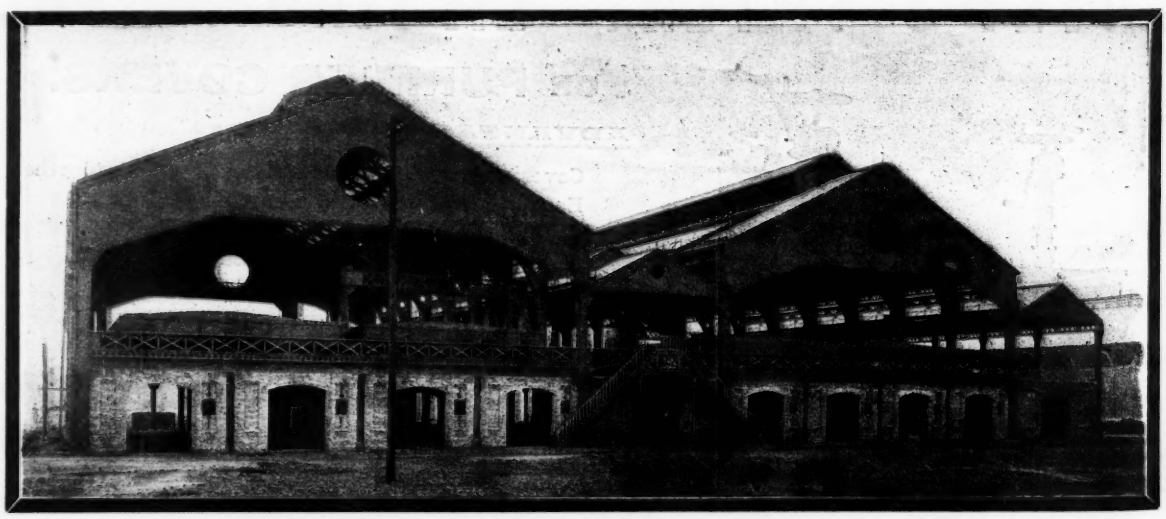

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